Pyramid Way and McCarran Boulevard Intersection Improvement Project

ENVIRONMENTAL IMPACT STATEMENT

RTC Project No. 73299
Federal Project No. CM-0191-(063)

TRAFFIC NOISE IMPACT ASSESSMENT

Regional Transportation Commission of Washoe County,
Federal Highway Administration,
and
Nevada Department of Transportation

PARSONS
3480 GS Richards Boulevard
Carson City, NV 89703
(775) 885-2249

June 2012

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EXECUTIVE SUMMARY

The purpose of this report is to assess future traffic noise levels and provide appropriate noise abatement recommendations for the Pyramid Way and McCarran Boulevard Intersection Improvement Project. The proposed project will widen this intersection and increase the number of through travel lanes along Pyramid Way to three general purpose lanes per direction of travel.

The noise impact evaluation criteria for this project are in agreement with the Noise Abatement Criteria (NAC) established by the Federal Highway Administration (FHWA) in the Procedures for Abatement of Highway Traffic Noise and Construction Noise (23 CFR Part 772) and adopted by the Nevada Department of Transportation (NDOT) in the Traffic and Construction Noise Abatement Policy. The key traffic noise impact threshold for this assessment is approaching or exceeding the NAC of 67 dBA for outdoor use areas at residences, schools, and churches.

NDOT considers a traffic noise abatement measure that abates at least 5 dB for 75% of the first, or front, row of impacted receptors as acoustically feasible. Engineering feasibility and reasonableness must also be demonstrated for any noise abatement measure to be funded and constructed. Three criteria are used to evaluate the reasonableness of abatement being considered: the points-of-view of the benefited property owners opposed to the construction of a noise barrier, the cost effectiveness of the abatement measure, and the noise reduction design goal (NRG). NDOT has defined the NRG as 7 dB. In assessing cost effectiveness, NDOT uses $40,000 per benefited unit of sensitive land use. Estimated cost was calculated based on $38 per square foot of wall constructed.

The FHWA Traffic Noise Model (TNM) Version 2.5, was used to predict future traffic noise levels. Noise measurements were used to establish existing noise levels and – where appropriate – to calibrate the noise model. Typically, the largest project-related changes in traffic noise levels are predicted at receptor locations where roadway widening would eliminate intervening rows of houses turning second row receptors into first row receptors, thereby increasing traffic noise exposure. However, noise analysis shows that the future noise level for most of these receptors would be reduce to noise levels below NAC, which is due to the privacy walls that will be erected to abate visual impacts.

At impacted areas, the considered soundwalls are expected to meet NDOT acoustical feasibility requirements. Recommended soundwalls are those that also meet engineering feasibility and cost-reasonableness criteria. Table I presents a summary of the considered soundwalls, including the number of benefited receptors. Table II summarizes the cost-reasonableness evaluation for these soundwalls.

Noise at the construction sites will be intermittent and intensity will vary. The degree of construction noise impacts may vary for different areas of the project site and depending on the nature of construction activities. Contract documents shall address means to minimize noise associated with construction activities.

TABLE I – SUMMARY OF CONSIDERED BARRIERS

Barrier No.	Location	Land Use[1]	Representative Receptors	Benefited Units	Minimum Height to Meet Acoustical Feasibility Criteria (ft)	Length (ft)
S37	Westbound McCarran Boulevard R/W	SFR	R16	1	8	316
S79	Northwest corner of Pyramid Way & McCarran Boulevard R/W	SFR	R43	1	10	285
S83	Southbound Pyramid Way R/W & Property Line	SFR	R45 to R47	3	10	259
S85	Southbound Pyramid Way R/W & Property Line	SFR	R49	1	8	170
S91	Southbound Pyramid Way R/W & Property Line	SCH	R54	1	6	157

Notes:

1 - Land Use: SFR - single-family residence; SCH - school. Benefited count is the number of dwellings or units of non-residential land use receiving 7 or more dB of noise reduction from the abatement.

2 - Cost effectiveness allowance was calculated using $40,000 per benefited receptor in accordance to the NDOT Policy.

TABLE II – SOUNDWALL COST-REASONABLENESS EVALUATION

Barrier No.	Benefited Units	Length (ft)	Minimum Height to Meet Acoustical Feasibility Criteria				Increased Height to Approach/Achieve Noise Reduction Goal While Maintaining Reasonable Cost					
							2 Feet Taller			4 Feet Taller		
			Height (ft)	Total Cost Allowance[1]	Estimated Cost[2]	Reasonable Cost?	Estimated Cost[2]	Reasonable Cost?	NRG[3] Achieved at All First-Row Receptors?	Estimated Cost[2]	Reasonable Cost?	NRG[3] Achieved at All First-Row Receptors?
S37	1	316	8	$40,000	$96,064	N						
S79	1	285	10	$40,000	$108,300	N						
S83	3	259	10	$120,000	$98,420	Y	$118,104	Y	Y	$137,788	N	Y
S85	1	170	8	$40,000	$51,680	N						
S91	1	157	6	$40,000	$35,796	Y	$47,728	N	Y			

Notes:

1 - Cost allowance was calculated using $40,000 per benefited receptor in accordance to the NDOT Policy.

2 - Estimated cost was calculated based on $38 per square foot of wall constructed.

3 - Noise Reduction design Goal.

1.0 INTRODUCTION

The purpose of this report is to assess future traffic noise levels and provide appropriate noise abatement recommendations for the Pyramid Way and McCarran Boulevard Intersection Improvement Project. The proposed project will widen this intersection and increase the number of through travel lanes along Pyramid Way to three general purpose lanes per direction of travel. This report considers the design-year traffic noise impacts at noise-sensitive receptors within the project limits. This project is defined as Type 1 by 23 *Code of Federal Regulations* (CFR*)* 772; therefore, a full noise assessment is required. The study includes (a) long-term noise measurements; (b) short-term measurements; (c) roadway traffic noise modeling using the Traffic Noise Model (TNM); and (d) considered and recommended noise abatement/mitigation.

2.0 PROJECT DESCRIPTION

The Regional Transportation Commission of Washoe County (RTC), in cooperation with the Nevada Department of Transportation (NDOT) and the Federal Highway Administration (FHWA), is studying operational improvements to the intersection of McCarran Boulevard (State Route 650) and Pyramid Way (State Route 445) in Sparks, Washoe County, Nevada. Figure 1 shows the project limits in the context of the project vicinity.

McCarran Boulevard and Pyramid Way currently have two through lanes in each direction. The proposed improvements would widen Pyramid Way to three lanes in each direction from Queen Way to York Way. McCarran Boulevard would remain two lanes in each direction. The proposed operational improvements at the intersection consist of additional turning lanes: eastbound McCarran Boulevard to northbound Pyramid Way; westbound McCarran Boulevard to southbound Pyramid Way; westbound McCarran Boulevard to northbound Pyramid Way; northbound Pyramid Way to westbound McCarran Boulevard; and southbound Pyramid Way to westbound McCarran Boulevard. The Pyramid Way and Queen Way intersection would also be reconfigured to improve access to the surrounding neighborhoods. Widening of Pyramid Way and McCarran Boulevard would occur on the east and north/south sides, respectively, to accommodate these improvements. Single-family residences as well as a church and a commercial development along Pyramid Way and McCarran Boulevard would be demolished as part of the proposed project. Existing control of access would be maintained under the Build Alternative. In areas where a row of homes would be acquired, privacy walls would be constructed to provide separation between the residential neighborhoods and the roadway.

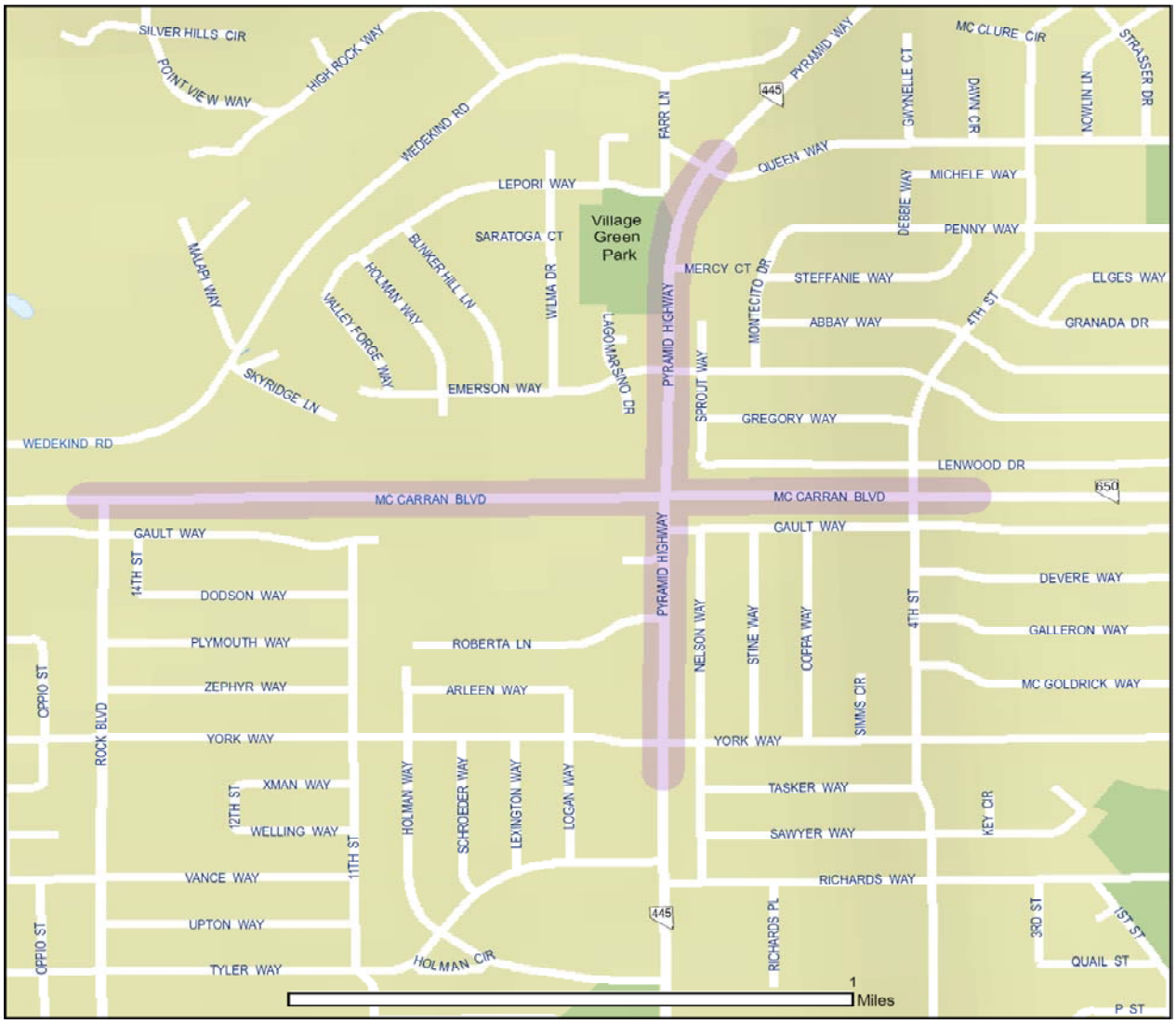


FIGURE 1 – PROJECT LIMITS AND PROJECT VICINITY

3.0 FUNDAMENTALS OF TRAFFIC NOISE

A brief discussion of fundamental traffic noise concepts is provided in this section.

Sound, Noise, and Acoustics

Sound is a disturbance created by a moving or vibrating source in a gaseous or liquid medium or the elastic stage of a solid, and it is capable of being detected by the hearing organs. Sound may be thought of as the mechanical energy of a vibrating object transmitted by pressure waves through a medium to a human ear. For traffic sound, the medium of concern is air. Noise is defined as sound that is loud, unpleasant, unexpected, or undesired.

Frequency and Hertz

A continuous sound can be described by its frequency (pitch) and its amplitude (loudness). Frequency relates to the number of pressure oscillations per second. Low-frequency sounds are low in pitch, such as the low notes on a piano, whereas high-frequency sounds are high in pitch, such as the high notes on a piano. Frequency is expressed in terms of oscillations, or cycles, per second. Cycles per second are commonly referred to as Hertz (Hz). The extreme range of frequencies that can be heard by the healthiest human ears spans from 16 to 20 Hz on the low end to approximately 20,000 Hz (or 20 kilohertz [kHz]) on the high end.

Sound Pressure Levels and Decibels

The *amplitude* of a sound determines its loudness. Loudness of sound increases and decreases with increasing and decreasing amplitude. Sound pressure amplitude is measured in units of micro-Newton per square meter (N/m^2), also called micro-Pascal (µPa). One µPa is approximately one hundred billionths (0.00000000001) of normal atmospheric pressure. *Sound pressure level* (L_p) is used to describe in logarithmic units the ratio of actual sound pressures to a reference pressure squared. These units are called decibels, abbreviated dB.

Addition of Decibels

Because decibels are logarithmic units, sound pressure levels cannot be added or subtracted by ordinary arithmetic means. When two sounds of equal L_p are combined, they will produce a combined L_p, which is 3 dB greater than the original individual L_p. In other words, sound energy must be doubled to produce a 3-dB increase. If two sound levels differ by 10 dB or more, the combined L_p is equal to the higher L_p; in other words, the lower sound level does not increase the higher sound level.

A-Weighted Decibels

Sound pressure level alone is not a reliable indicator of loudness. The frequency, or pitch, of a sound also has a substantial effect on how humans will respond. Although the intensity (energy per unit area) of the sound is a purely physical quantity, the loudness or human response is determined by the characteristics of the human ear. In general, the healthy human ear is most sensitive to sounds between 1,000 Hz and 5,000 Hz, and it perceives a sound within that range as being more intense than a sound of higher or lower frequency with the same magnitude. To approximate the frequency response of the human ear, a series of L_p adjustments is usually applied to the sound level at different frequencies. These adjustments are referred to as a *weighting network*. The A-scale weighting network approximates the frequency response of the average young ear when listening to most ordinary sounds. Noise levels for traffic noise reports are typically reported in terms of A-weighted decibels (dBA). In environmental noise studies, A-weighted L_ps are commonly referred to as noise levels. Figure 2 shows typical A-weighted noise levels.

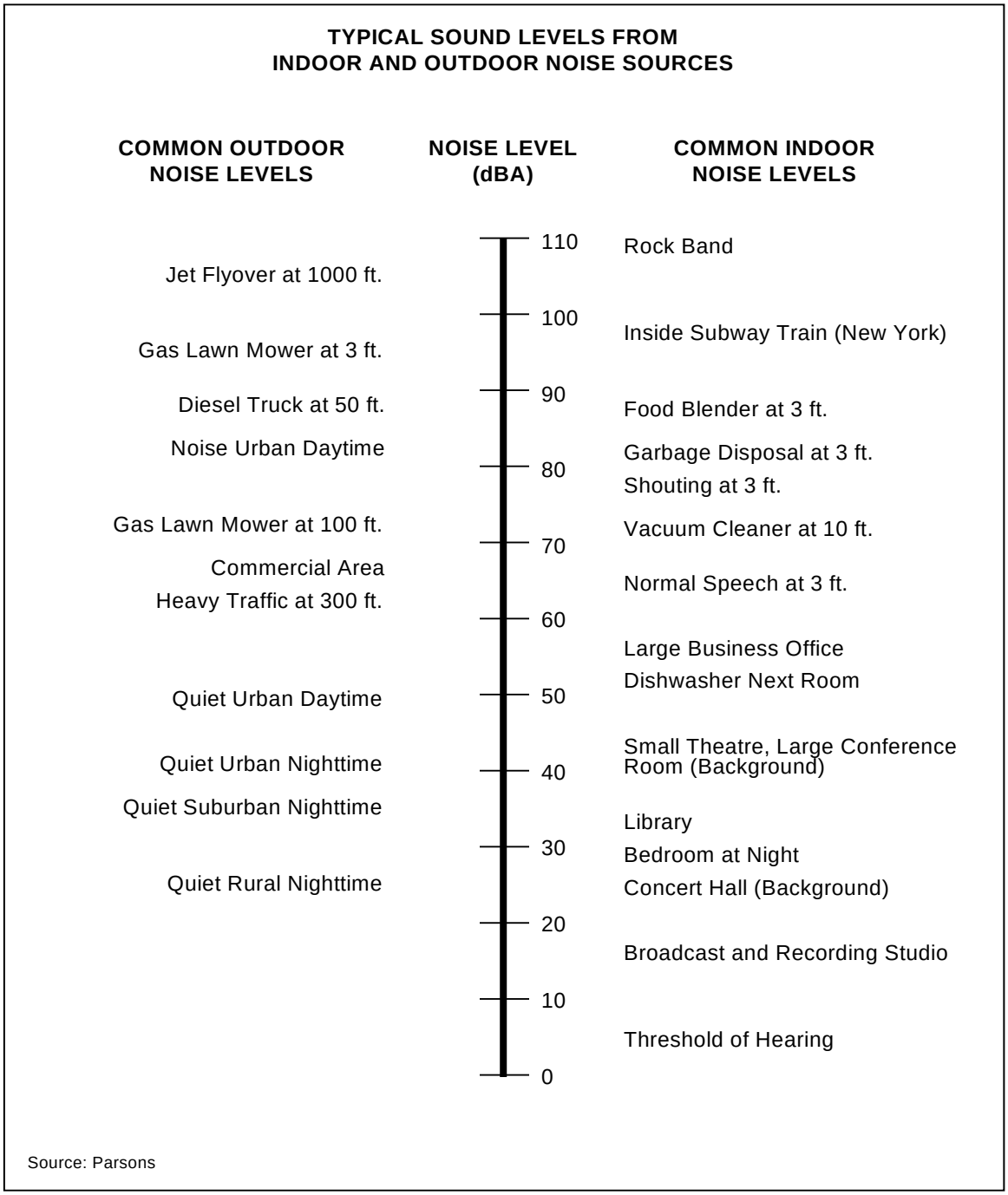


FIGURE 2 – TYPICAL A-WEIGHTED NOISE LEVELS

Human Response to Changes in Noise Levels

It is widely accepted that the average healthy ear can barely perceive noise-level changes of 3 dB. A change of 5 dB is readily perceptible, and a change of 10 dB is perceived as being twice or half as loud. As discussed previously, a doubling of sound energy results in a 3-dB increase in sound, which means that a doubling of sound energy (e.g., doubling the volume of traffic on a highway) would result in a barely perceptible change in sound level.

Noise Descriptors

Noise in our daily environment fluctuates over time. Some noise levels occur in regular patterns, others are random. Some noise levels fluctuate rapidly, others slowly. Some noise levels vary widely; others are relatively constant. Various noise descriptors have been developed to describe time-varying noise levels. The following is a list of the noise descriptors most commonly used in traffic noise analysis:

- **Equivalent Sound Level (L_{eq})** – L_{eq} represents an average of the sound energy occurring over a specified period. L_{eq} is, in effect, the steady-state sound level that, in a stated period, would contain the same acoustical energy as the time-varying sound that actually occurs during the same period. The 1-hour A-weighted equivalent sound level, L_{eq} (h), is the energy average of the A-weighted sound levels occurring during a 1-hour period and is the basis for Noise Abatement Criteria (NAC) used by NDOT and FHWA.
- **Maximum Sound Level (L_{max})** – L_{max} is the highest instantaneous sound level measured during a specified period.
- **Insertion Loss (I.L.)** – I.L. is the actual noise-level reduction at a specific receptor due to construction of a noise barrier between the noise source (traffic) and the receptor. Generally, it is the net effect of the noise barrier attenuation and the change in ground effects due to the altered sound path.

4.0 FEDERAL AND STATE POLICIES AND PROCEDURES

The traffic noise impact evaluation criteria for this project are in agreement with the NAC established by FHWA (FHWA, 2010) in the Procedures for Abatement of Highway Traffic Noise and Construction Noise (23 CFR Part 772) and adopted by NDOT in the Traffic and Construction Noise Abatement Policy (NDOT, 2011). FHWA NAC are reproduced in Table 1. For residential land uses, the outdoor traffic noise criterion is 67 dBA. For parks, schools, and hospitals, the outdoor noise criterion is also 67 dBA. For these non-residential noise-sensitive land uses, interior noise exposure may be evaluated if no outdoor areas of frequent human use are present. The applicable interior noise criterion is 52 dBA.

Under FHWA regulations, noise abatement measures must be considered when the predicted traffic noise levels “approach” or “exceed” the NAC or when the predicted noise levels “substantially exceed” existing noise levels, and it is reasonable and feasible to abate. NDOT defines the term "approach" for the purposes of traffic noise analysis on new highway construction or reconstruction projects as 1 dB less than the NAC. Therefore, traffic noise abatement is considered when predicted future outdoor traffic noise levels from the proposed project at residential land uses, parks, schools, and hospitals are 66 dB or higher. Furthermore, NDOT defines “substantially exceed” as a 15-dBA noise-level increase from the existing ambient noise levels to future noise levels.

NDOT considers a traffic noise abatement measure, such as a soundwall that abates at least 5 dB for 75% of the first, or front, row of impacted receptors as acoustically feasible. Engineering feasibility and reasonableness must also be demonstrated for any noise abatement measure to be funded and constructed. Three criteria are used to evaluate the reasonableness of abatement being considered: the points-of-view of the benefited property owners opposed to the construction of a noise barrier, the cost effectiveness of the abatement measure, and the noise reduction design goal (NRG). NDOT has defined the NRG as 7 dB. In assessing cost effectiveness, NDOT uses $40,000 per benefited unit of sensitive land use. Estimated cost was calculated based on $38 per square foot of wall constructed.

TABLE 1 – NOISE ABATEMENT CRITERIA

Activity Category	Noise Abatement Criteria L_{eq}, dBA	Description of Activity Category
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (Exterior)	Residential.
C	67 (Exterior)	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52 (Interior)	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72 (Exterior)	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A–D or F.
F	--	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	--	Undeveloped lands that are not permitted.

Source: 23 CFR Part 772, 2010.

5.0 STUDY METHOD AND PROCEDURES

The FHWA Traffic Noise Model, TNM Version 2.5, was used for the noise computations (FHWA, 2004). TNM 2.5 input is based on a three-dimensional grid created for the study area to be analyzed. All roadway, barrier, and receptor (referred to in TNM as "receiver") points are defined by their x, y, and z coordinates. Roadways and barriers are coded into TNM 2.5 as line segments defined by their end points. Receptors, defined as single points, are typically located at sensitive land uses, such as residences, schools, and churches. Receptors are typically modeled at a height of 5 feet above ground elevation. Figures A-1 through A-4 in Appendix A show modeled receptor locations.

To determine the noise levels generated by traffic, the TNM 2.5 computer program requires inputs of traffic volumes, speeds, and vehicle types. Three vehicle types were input into the model, namely cars, medium trucks, and heavy trucks. The propagation path between source and receptor is modeled in TNM 2.5 by specifying rows of houses or building structures, special terrain features, and barriers. Propagation of noise can be further specified by selecting ground types, such as hard soil, loose soil, pavement, water, lawn, field grass, granular snow, and powder snow. "Lawn" was used for this study.

A traffic count was conducted during the measurement periods at three long-term measurement sites to allow measurement results to be compared with TNM output under comparable traffic conditions. Traffic volumes along Pyramid Way north of McCarran Boulevard were recorded during a 20-minute period using a video camera. Measured and modeled traffic noise levels were compared at each of the three measurement locations. This comparison is summarized in Table 2. Table 3 shows the associated traffic volumes.

TABLE 2 – TRAFFIC NOISE MODEL CALIBRATION

Calibration Site	Measurement Site	Modeled Rec. No.	Date	Time	Noise Levels, $L_{eq(h)}$, dBA		Deviation, dB	Applied Adjustment, dB
					Measured	Modeled		
1	LT5	R62	05/03/11	11:40 AM	57.7	55.6	-2.1	2.0
2	LT6	R50	05/03/11	11:40 AM	60.7	60.9	0.2	--
3	LT7	R65	05/03/11	11:40 AM	53.9	55.0	1.1	--

Source: Parsons, 2011

TABLE 3 – CALIBRATION TRAFFIC VOLUMES

Description of Traffic Lane	Number of Lanes	Total Traffic Volumes	Auto Travel Speeds, mph	Truck Travel Speeds, mph	Hourly Volumes by Vehicle Type		
					Cars	Medium Trucks	Heavy Trucks
NB Pyramid Thru Lanes	2	1,254	35	35	1,212	24	18
SB Pyramid Thru Lanes	2	1,134	35	35	1,068	39	27

Source: Parsons, 2011

The locations of the measurement sites listed in Table 3 are shown in Figures A-3 and A-4 of Appendix A. For Calibration Sites 2 and 3, the deviations between measured and corresponding modeled noise levels were below the range where consideration of calibration adjustments is typically warranted. At Calibration Site 1, the deviation was within this range. Calibration Site 1 is associated with Receptor R62 and also adequately represents noise exposure at Receptor R61. At both Receptors R61 and R62, noise propagation circumstances would change substantively between No Build and Build conditions due to the demolition of an intervening row of houses and property wall. Nevertheless, application of an adjustment to the model at these receptors can be justified for both No Build and Build conditions and would result in a more conservative analysis. Accordingly, an adjustment of 2.0 dB was applied.

6.0 EXISTING ENVIRONMENT

A site visit was conducted by Parsons personnel from May 2 to 4, 2011 to perform field noise measurements, record traffic volumes for calibration, and identify representative noise-sensitive locations. Background noise measurements in the project vicinity were conducted according to the guidelines outlined in FHWA's "Measuring of Highway-Related Noise" (FHWA, 1996). Larson-Davis Models 812 (LD812) and 820 (LD820) Precision Integrated Sound Level Meters were used to conduct the noise measurements. The LD812 and LD820 are ANSI Type 1 instruments. The instruments were calibrated with a Larson Davis Model CA 250 (LD-CA250) acoustic calibrator immediately before and after each measurement, and they were operated according to the manufacturer's specifications.

Current traffic noise sources within the project area primarily consist of traffic on Pyramid Way and McCarran Boulevard. Within the study area, some residences along these roadways are shielded from traffic noise exposure by existing property walls or soundwalls. This study considers residences that are currently separated from project roadways by intervening rows of homes, but would become first-row receptors after property acquisitions required for project implementation. Under existing conditions, the intervening rows of homes and greater distances from project corridors result in relatively low traffic noise levels at these locations.

Long-term noise measurements – each 24 hours or more in duration -- were conducted at seven locations and short term noise measurements (each 15 to 20 minutes in duration) were conducted at five different locations. These selected sites are considered acoustically representative of other noise-sensitive land uses in the areas surrounding the measurement locations. These measurement sites where either the existing first row residences or residences that will become first row after house in front of them are demolished. Long-term noise measurements were used to establish the peak noise hour at the various locations of the study area. If short term noise measurements were conducted with the identified peak noise hours, they were used as is; however, if they were conducted outside the peak noise hour, then they were adjusted to the peak noise hour using a nearby representative long-term noise measurement results.. Figures A-1 through A-4 of Appendix A illustrate the measurement sites. Appendix B includes field notes and detailed sketches of the monitoring locations as well as graphs of long-term measurement data. Appendix C shows noise measurement site photographs.

Table 4 presents the long-term measurement results. The table shows the street address of each measurement site, the dates and start time for each measurement, and the measured loudest-hour noise levels. Table 5 summarizes the short-term measurement parameters. For each short-term measurement, Table 5 reports both the measured short-term L_{eq} and the corresponding estimated loudest-hour L_{eq}. This table also provides a corresponding long-term measurement location for each short-term measurement. Each loudest-hour L_{eq} was estimated by adjusting the measured short-term L_{eq} by the difference between the L_{eq} measured at the corresponding long-term site during the loudest hour and the L_{eq} measured at that long-term site when the short-term measurement was conducted.

TABLE 4 – LONG-TERM NOISE MEASUREMENTS

Site No.	Street Address, City	Land Use[1]	Noise Abatement Category (Criterion)	Meter Location	Meas. Dates	Start Time	Measured Peak Hour Leq, dBA
LT1	2220 Nelson Way, Sparks	SFR	B (67)	Side yard	05/02/11-05/04/11	17:09	53
LT2	1200 Gault Way, Sparks	SFR	B (67)	Backyard	05/02/11-05/04/11	14:17	59
LT3	655 Gault Way, Sparks	SFR	B (67)	Side yard	05/02/11-05/04/11	12:55	54
LT4	465 Lenwood Drive, Sparks	SFR	B (67)	Backyard	05/02/11-05/04/11	13:36	69
LT5	3170 Sprout Way, Sparks	SFR	B (67)	Backyard	05/02/11-05/04/11	15:20	60
LT6	3232 Jamestown Court, Sparks	SFR	B (67)	Backyard	05/02/11-05/03/11	16:29	62
LT7	771 Mercy Court, Sparks	SFR	B (67)	Backyard	05/02/11-05/04/11	15:54	58

Note:
1. SFR – Single-family residential.

TABLE 5 – SHORT-TERM NOISE MEASUREMENTS

Site No.	Street Address, City	Land Use[1]	Noise Abatement Category (Criterion)	Meter Location	Meas. Dates	Start Time[2]	Meas. Leq, dBA	Adjusted Peak-Hour Leq, dBA	Adjusted to Long-Term Site
ST1	2600 Nelson Way, Sparks	SFR	B (67)	Front yard	05/03/11	09:06	52.0	57	LT1
ST2A	2900 N. McCarran Boulevard (Immaculate Conception Church), Sparks	CHR	C (67)	Courtyard	05/03/11	10:24	59.4	61	LT2
ST2B					05/04/11	08:40	58.9	60	LT2
ST3	2965 McCarran Boulevard, Sparks	SFR	B (67)	Dirt road	05/03/10	10:56	60.7	63	LT6
ST4	2755 4th Street (Drake Elementary School), Sparks	SCH	C (67)	Near classrooms	05/03/10	14:00	53.2	53	LT3
ST5	520 Queen Way (Church of Christ at Queen's Way), Sparks	SCH	C (67)	Near basketball court	05/03/10	12:27	54.3	57	LT7

Notes:
1. SFR – Single-family residential; SCH – School; CHR – Church.
2. All short-term measurements were 15 to 20 minutes in duration.

7.0 FUTURE NOISE IMPACTS AND ABATEMENT MEASURES

This traffic noise analysis was conducted to determine the noise levels at areas of frequent human use, to evaluate the performance of the existing property walls and soundwalls, and to provide feasible and reasonable abatement measures for the proposed project for design year 2030. Figures A-1 through A-4 in Appendix A show the locations of modeled sensitive receptors.

This noise analysis uses traffic volumes that represent peak demand volumes or highest traffic noise conditions, whichever are lower. In congested areas, the highest hourly traffic noise levels do not occur during peak traffic hours but rather when traffic is heavy but remains free-flowing. Once traffic become stop and go the overall traffic noise drops substantially; therefore, typically the highest traffic noise levels occur just before and after peak traffic hours. Traffic engineers refer to this condition as Level of Service (LOS) C. LOS C volumes for through travel lanes were assumed to be 560 vehicles per lane per hour. For Future No Build conditions, traffic noise exposure at Receptors R17 through R22 and R29 through R42 was deemed to be worst in the PM. For Future Build conditions, traffic noise exposure at Receptors R1 through R22, R29 through R41, and R61 through R72 was deemed to be worst in the PM. For the remaining modeled receptors under Future No Build and Future Build conditions, traffic noise exposure was deemed to be worst in the AM.

The traffic volumes were distributed between cars, medium trucks, buses, and heavy trucks using the truck percentages from NDOT's Urban Vehicle Distribution and Average Equivalent Single Axle Loads (NDOT, 2005). Travel speeds were modeled based upon posted speed limits – 35 mph for Pyramid Way and 45 mph for McCarran Boulevard. Tables 6 through 9 present the traffic volumes, speeds, and vehicle distributions used for this study.

Traffic noise levels for the future loudest-hour traffic conditions were calculated using TNM 2.5. Many of the traffic noise impacts identified in this study occur at locations currently experiencing perceptible traffic noise levels that would continue after project implementation. In areas where a row of homes would be acquired, privacy walls would be constructed to provide separation between the residential neighborhoods and the roadway.

Typically, large project-related changes in traffic noise levels are predicted at receptor locations where roadway widening would eliminate intervening rows of houses turning second row receptors into first row receptors, thereby increasing traffic noise exposure. Such locations include Receptors R17 through R25, R33 through R41, and R61 through R66; however, noise analysis shows that the future noise level for most of these receptors would be reduced below existing noise levels. This is due to the privacy walls that will be erected to abate visual impacts. Other receptor locations where existing noise levels will be greater than future levels are Receptors R25A through R28 and R30 through R32. This is also due to the privacy walls that will be erected to abate visual impacts for first row receptors that currently do not have privacy walls

Traffic on a given roadway could create certain peak hourly average noise level. This peak hourly noise level would not change unless lanes are added to the roadway. For a given roadway, if the existing peak hour average traffic noise levels are at the highest level free-flowing traffic can create, then there would be no change in the future peak hourly traffic noise levels. However, the time of day the peak traffic noise occurs couldchange based on future traffic patterns. Future noise levels for some receptors are lower than existing noise levels. There are three primary reasons for this: future traffic volumes are lower than the existing traffic volumes, future traffic lanes are farther away from sensitive noise receptors, or the addition of privacy walls for visual abatement.

At impacted areas, the considered soundwalls meet NDOT acoustical feasibility requirements. Recommended soundwalls also meet engineering feasibility and cost-reasonableness criteria. Table 10 summarizes the results of the predicted levels at the representative noise-sensitive receptors within the study area. Table 11 presents a summary of the considered soundwalls, including the number of benefited receptors. Table 12 summarizes the cost-reasonableness evaluation for these soundwalls.

TABLE 6 – NOISE MODEL TRAFFIC VOLUMES: FUTURE NO BUILD (AM)

Description of Traffic Lane	Number of Lanes	Total Traffic Volumes	Travel Speeds, mph	Volumes by Vehicle Type					
				Cars	% Cars	Medium Trucks	% MT	Heavy Trucks	% HT
Pyramid Way									
North of McCarran Boulevard									
Northbound	2	1,120 [1]	35	1,062	94.8	26	2.3	32	2.9
Southbound	2	1,120 [1]	35	1,062	94.8	26	2.3	32	2.9
South of McCarran Boulevard									
Northbound	2	851	35	807	94.8	20	2.3	25	2.9
Southbound	2	1,120 [1]	35	1,062	94.8	26	2.3	32	2.9
McCarran Boulevard									
West of Pyramid Way									
Eastbound	2	1,120 [1]	45	1,062	94.8	26	2.3	32	2.9
Westbound	2	1,120 [1]	45	1,062	94.8	26	2.3	32	2.9
East of Pyramid Way									
Eastbound	2	628	45	595	94.8	14	2.3	18	2.9
Westbound	2	1,120 [1]	45	1,062	94.8	26	2.3	32	2.9

Note:
1 - Total volumes are those that are expected to generate the balance between flow rate and flow speed that would produce the highest traffic noise levels.

TABLE 7 – NOISE MODEL TRAFFIC VOLUMES: FUTURE NO BUILD (PM)

Description of Traffic Lane	Number of Lanes	Total Traffic Volumes	Travel Speeds, mph	Volumes by Vehicle Type					
				Cars	% Cars	Medium Trucks	% MT	Heavy Trucks	% HT
Pyramid Way									
North of McCarran Boulevard									
Northbound	2	1,120 [1]	35	1,062	94.8	26	2.3	32	2.9
Southbound	2	1,120 [1]	35	1,062	94.8	26	2.3	32	2.9
South of McCarran Boulevard									
Northbound	2	1,120 [1]	35	1,062	94.8	26	2.3	32	2.9
Southbound	2	907	35	860	94.8	21	2.3	26	2.9
McCarran Boulevard									
West of Pyramid Way									
Eastbound	2	1,120 [1]	45	1,062	94.8	26	2.3	32	2.9
Westbound	2	1,120 [1]	45	1,062	94.8	26	2.3	32	2.9
East of Pyramid Way									
Eastbound	2	975	45	924	94.8	22	2.3	28	2.9
Westbound	2	718	45	681	94.8	17	2.3	21	2.9

Note:
1 - Total volumes are those that are expected to generate the balance between flow rate and flow speed that would produce the highest traffic noise levels.

TABLE 8 – NOISE MODEL TRAFFIC VOLUMES: FUTURE BUILD (AM)

Description of Traffic Lane	Number of Lanes	Total Traffic Volumes	Travel Speeds, mph	Volumes by Vehicle Type					
				Cars	% Cars	Medium Trucks	% MT	Heavy Trucks	% HT
Pyramid Way									
North of McCarran Boulevard									
Northbound	3	797	35	756	94.8	18	2.3	23	2.9
Southbound	3	1,680 [1]	35	1,593	94.8	39	2.3	49	2.9
South of McCarran Boulevard									
Northbound	3	683	35	647	94.8	16	2.3	20	2.9
Southbound	3	1,680 [1]	35	1,593	94.8	39	2.3	49	2.9
McCarran Boulevard									
West of Pyramid Way									
Eastbound	2	493	45	467	94.8	11	2.3	14	2.9
Westbound	2	1,120 [1]	45	1,062	94.8	26	2.3	32	2.9
East of Pyramid Way									
Eastbound	2	375	45	356	94.8	9	2.3	11	2.9
Westbound	2	1,041 [1]	45	987	94.8	24	2.3	30	2.9

Note:
1 - Total volumes are those that are expected to generate the balance between flow rate and flow speed that would produce the highest traffic noise levels.

TABLE 9 – NOISE MODEL TRAFFIC VOLUMES: FUTURE BUILD (PM)

Description of Traffic Lane	Number of Lanes	Total Traffic Volumes	Travel Speeds, mph	Volumes by Vehicle Type					
				Cars	% Cars	Medium Trucks	% MT	Heavy Trucks	% HT
Pyramid Way									
North of McCarran Boulevard									
Northbound	3	1,680 [1]	35	1,593	94.8	39	2.3	49	2.9
Southbound	3	908	35	861	94.8	21	2.3	26	2.9
South of McCarran Boulevard									
Northbound	3	1,680 [1]	35	1,593	94.8	39	2.3	49	2.9
Southbound	3	570	35	540	94.8	13	2.3	17	2.9
McCarran Boulevard									
West of Pyramid Way									
Eastbound	2	1,120 [1]	45	1,062	94.8	26	2.3	32	2.9
Westbound	2	1,000	45	948	94.8	23	2.3	29	2.9
East of Pyramid Way									
Eastbound	2	822	45	779	94.8	19	2.3	24	2.9
Westbound	2	724	45	686	94.8	17	2.3	21	2.9

Note:
1 - Total volumes are those that are expected to generate the balance between flow rate and flow speed that would produce the highest traffic noise levels.

TABLE 10 – PREDICTED TRAFFIC NOISE LEVELS AND BARRIER ANALYSIS

REC. NO.	LAND USE[2]	EXISTING NOISE LEVELS[1,3] Leq(h), dBA	FUTURE PEAK HOUR NOISE LEVELS, Leq(h), dBA[1]			
				BUILD		
			NO BUILD	WITHOUT BARRIER	ACTIVITY CATEGORY and NAC ( )	IMPACT TYPE (S, A/E or NONE)[4]
R 1 W	SFR	61 E	62	61	B (67)	NONE
R 2 W	SFR	50 E	51	50	B (67)	NONE
R 3 W	SFR	57 E	58	57	B (67)	NONE
R 4 W	SFR	57 E	58	57	B (67)	NONE
R 5 W	SFR	59 M,LT2	60	60	B (67)	NONE
R 6 W	SFR	59 E	60	60	B (67)	NONE
R 7 W	SFR	52 E	53	53	B (67)	NONE
R 8	CHR	68 E	69	69	--	--
		48 E	49	49	D (52)	NONE
R 9	SFR	54 E	55	54	B (67)	NONE
R 10	SFR	59 E	60	58	B (67)	NONE
R 11	SFR	64 E	65	64	B (67)	NONE
R 12 W	CHR	61 M,ST2A	61	61	C (67)	NONE
R 13 W	CHR	60 M,ST2B	62	61	C (67)	NONE
R 14 W	CHR	55 E	57	57	C (67)	NONE
R 15	SFR	54 E	55	55	B (67)	NONE
R 17 W,V	SFR	57 E	57	59	B (67)	NONE
R 18 V	SFR	54 M,LT3	54	56	B (67)	NONE
R 19 *	SFR	53 E	53	54	B (67)	NONE
R 20 V	SFR	56 E	56	55	B (67)	NONE
R 21 V	SCH	54 M,ST4	58	57	B (67)	NONE
R 22 V	SCH	55 E	59	57	B (67)	NONE

Notes:

1 - Leq(h) are A-weighted, peak hour noise levels in decibels.

2 - Land Use: SFR - single-family residence; SCH - school; CHR - church; REC - recreational area.

3 - M - Measured noise level; STxx or LTxx - measurement site number; E - Estimated from No-Build Alternative and measurement sites.

4 - S = Substantial Increase (15 dB or more); A/E = Approach or exceed NAC.

W - Receptor protected by existing private property wall or soundwall.

V - Receptor protected by future privacy wall.

* - Non-first-row receptors under Build conditions.

TABLE 10 – PREDICTED TRAFFIC NOISE LEVELS AND BARRIER ANALYSIS (CONTINUED)

REC. NO.	LAND USE[2]	EXISTING NOISE LEVELS[1,3] Leq(h), dBA	FUTURE PEAK HOUR NOISE LEVELS, Leq(h), dBA[1]			
				BUILD		
			NO BUILD	WITHOUT BARRIER	ACTIVITY CATEGORY and NAC ( )	IMPACT TYPE (S, A/E or NONE)[4]
R 23 W	SFR	53 E	56	57	B (67)	NONE
R 24 V	SFR	52 E	55	55	B (67)	NONE
R 25 V	SFR	50 E	53	54	B (67)	NONE
R 25A V	SFR	69 E	72	63	B (67)	NONE
R 26 V	SFR	69 E	72	63	B (67)	NONE
R 27 V	SFR	69 M,LT4	72	63	B (67)	NONE
R 28 V	SFR	69 E	72	65	B (67)	NONE
R 29 *,V	SFR	54 E	55	54	B (67)	NONE
R 30 V	SFR	66 E	67	63	B (67)	NONE
R 31 V	SFR	66 E	67	62	B (67)	NONE
R 32 V	SFR	66 E	67	62	B (67)	NONE
R 33 *,V	SFR	53 M,LT1	54	54	B (67)	NONE
R 34 V	SFR	55 E	56	57	B (67)	NONE
R 35 V	SFR	51 E	52	53	B (67)	NONE
R 36 V	SFR	55 E	55	56	B (67)	NONE
R 37 V	SFR	54 E	54	55	B (67)	NONE
R 38 V	SFR	57 M,ST1	57	59	B (67)	NONE
R 39 V	SFR	53 E	53	55	B (67)	NONE
R 40 V	SFR	54 E	54	56	B (67)	NONE
R 41 V	SFR	56 E	56	56	B (67)	NONE
R 42	CHR	56 E	56	58	--	--
		36 E	36	38	D (52)	NONE

Notes:

1 - Leq(h) are A-weighted, peak hour noise levels in decibels.

2 - Land Use: SFR - single-family residence; SCH - school; CHR - church; REC - recreational area.

3 - M - Measured noise level; STxx or LTxx - measurement site number; E - Estimated from No-Build Alternative and measurement sites.

4 - S = Substantial Increase (15 dB or more); A/E = Approach or exceed NAC.

W - Receptor protected by existing private property wall or soundwall.

V - Receptor protected by future privacy wall.

* - Non-first-row receptors under Build conditions.

TABLE 10 – PREDICTED TRAFFIC NOISE LEVELS AND BARRIER ANALYSIS (CONTINUED)

REC. NO.	LAND USE[2]	EXISTING NOISE LEVELS[1,3] Leq(h), dBA	FUTURE PEAK HOUR NOISE LEVELS, Leq(h), dBA[1]			
				BUILD		
			NO BUILD	WITHOUT BARRIER	ACTIVITY CATEGORY and NAC ( )	IMPACT TYPE (S, A/E or NONE)[4]
R 56 W	SFR	48 E	50	50	B (67)	NONE
R 57 W	SFR	49 E	51	52	B (67)	NONE
R 58 W	SFR	52 E	54	54	B (67)	NONE
R 59 W	SFR	48 E	50	49	B (67)	NONE
R 60	SFR	59 E	61	61	B (67)	NONE
R 61 W,V	SFR	59 E	59	62	B (67)	NONE
R 62 W,V	SFR	60 M,LT5,CAL1	60	61	B (67)	NONE
R 63 W,V	SFR	57 E	57	60	B (67)	NONE
R 64 W,V,*	SFR	52 E	52	56	B (67)	NONE
R 64A W,V	SFR	58 E	58	63	B (67)	NONE
R 65 W,V,*	SFR	58 M,LT7,CAL3	56	61	B (67)	NONE
R 66 W,V	SFR	60 E	58	64	B (67)	NONE
R 67	SFR	54 E	56	60	B (67)	NONE
R 68	SFR	54 E	56	59	B (67)	NONE
R 69	CHR	55 E	57	58	--	--
		45 E	47	48	D (52)	NONE
R 70	SCH	57 M,ST5	59	60	C (67)	NONE
R 71	SFR	54 E	56	57	B (67)	NONE
R 72	SFR	56 E	58	59	B (67)	NONE

Notes:

1 - Leq(h) are A-weighted, peak hour noise levels in decibels.

2 - Land Use: SFR - single-family residence; SCH - school; CHR - church; REC - recreational area.

3 - M - Measured noise level; STxx or LTxx - measurement site number; E - Estimated from No-Build Alternative and measurement sites.

4 - S = Substantial Increase (15 dB or more); A/E = Approach or exceed NAC.

W - Receptor protected by existing private property wall or soundwall.

V - Receptor protected by future privacy wall.

* - Non-first-row receptors under Build conditions.

TABLE 10 – PREDICTED TRAFFIC NOISE LEVELS AND BARRIER ANALYSIS (CONTINUED)

REC. NO.	LAND USE[2]	EXISTING NOISE LEVELS[1,3] Leq(h), dBA	FUTURE PEAK HOUR NOISE LEVELS, Leq(h), dBA[1]																BARRIER NO./LOCATION
				BUILD															
							NOISE PREDICTION WITH BARRIER AND BARRIER INSERTION LOSS (I.L.)												
							6 ft		8 ft		10 ft		12 ft		14 ft		16 ft		
			NO BUILD	WITHOUT BARRIER	ACTIVITY CATEGORY and NAC ( )	IMPACT TYPE (S, A/E or NONE)[4]	Leq(h)	I.L.	Leq(h)	I.L.	Leq(h)	I.L.	Leq(h)	I.L.	Leq(h)	I.L.	Leq(h)	I.L.	
R 16	SFR	68 E	69	68	B (67)	A/E	64	4	62 AF	6	61	7	60	8	60	8	59	9	S37 R/W
R 43	SFR	65 E	68	68	B (67)	A/E	65	3	64	4	62 AF	6	61	7	61	7	60	8	S79 R/W
R 44	CHR	61 E	64	64	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		41 E	44	44	D (52)	NONE	--	--	--	--	--	--	--	--	--	--	--	--	
R 45 W	SFR	67 E	67	66	B (67)	A/E	62	4	60 AF	6	58 R	8	56	10	55	11	55	11	S83 R/W, Property Line
R 46 W	SFR	65 E	65	65	B (67)	NONE	63	2	61	4	59 AF,R	6	57	8	56	9	55	10	
R 47 W	SFR	66 E	66	66	B (67)	A/E	63	3	60 AF	6	58 R	8	57	9	55	11	55	11	
R 48 W,*	SFR	61 E	61	61	B (67)	NONE	59	2	59	2	57	4	56	5	55	6	55	6	S85 R/W, Property Line
R 49 W	SFR	67 E	67	66	B (67)	A/E	62	4	60 AF	6	57	9	56	10	54	12	53	13	
R 50 W	SFR	62 M,LT6,CAL2	62	61	B (67)	NONE	--	--	--	--	--	--	--	--	--	--	--	--	--
R 51 W	SFR	58 E	58	59	B (67)	NONE	--	--	--	--	--	--	--	--	--	--	--	--	
R 52 W	SFR	63 E	63	62	B (67)	NONE	--	--	--	--	--	--	--	--	--	--	--	--	
R 53	SFR	66 E	66	65	B (67)	NONE	--	--	--	--	--	--	--	--	--	--	--	--	--
R 54	SCH	69 E	69	67	C (67)	A/E	61 AF,R	6	58	9	56	11	54	13	53	14	52	15	S91 R/W, Property Line
R 55	REC	54 E	56	58	B (67)	NONE	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

1 - Leq(h) are A-weighted, peak hour noise levels in decibels.

2 - Land Use: SFR - single-family residence; SCH - school; CHR - church; REC - recreational area.

3 - M - Measured noise level; STxx or LTxx - measurement site number; E - Estimated from No-Build Alternative and measurement sites.

4 - S = Substantial Increase (15 dB or more); A/E = Approach or exceed NAC.

AF - Minimum height to meet NDOT acoustic feasibility criteria.

R - Recommended height to meet NDOT acoustical feasibility criteria and to maximize the achievement of noise reduction goals within cost-effectiveness constraints.

W - Receptor protected by existing private property wall or soundwall.

V - Receptor protected by future privacy wall.

* - Non-first-row receptors under Build conditions.

TABLE 11 – SUMMARY OF CONSIDERED BARRIERS

Barrier No.	Location	Land Use[1]	Representative Receptors	Benefited Units	Minimum Height to Meet Acoustical Feasibility Criteria (ft)	Length (ft)
S37	Westbound McCarran Boulevard R/W	SFR	R16	1	8	316
S79	Northwest corner of Pyramid Way & McCarran Boulevard R/W	SFR	R43	1	10	285
S83	Southbound Pyramid Way R/W & Property Line	SFR	R45 to R47	3	10	259
S85	Southbound Pyramid Way R/W & Property Line	SFR	R49	1	8	170
S91	Southbound Pyramid Way R/W & Property Line	SCH	R54	1	6	157

Notes:

1 - Land Use: SFR - single-family residence; SCH - school. Benefited count is the number of dwellings or units of non-residential land use receiving 7 or more dB of noise reduction from the abatement.

2 - Cost effectiveness allowance was calculated using $40,000 per benefited receptor in accordance to the NDOT Policy.

TABLE 12 – SOUNDWALL COST-REASONABLENESS EVALUATION

Barrier No.	Benefited Units	Length (ft)	Minimum Height to Meet Acoustical Feasibility Criteria				Increased Height to Approach/Achieve Noise Reduction Goal While Maintaining Reasonable Cost					
							2 Feet Taller			4 Feet Taller		
			Height (ft)	Total Cost Allowance[1]	Estimated Cost[2]	Reasonable Cost?	Estimated Cost[2]	Reasonable Cost?	NRG[3] Achieved at All First-Row Receptors?	Estimated Cost[2]	Reasonable Cost?	NRG[3] Achieved at All First-Row Receptors?
S37	1	316	8	$40,000	$96,064	N						
S79	1	285	10	$40,000	$108,300	N						
S83	3	259	10	$120,000	$98,420	Y	$118,104	Y	Y	$137,788	N	Y
S85	1	170	8	$40,000	$51,680	N						
S91	1	157	6	$40,000	$35,796	Y	$47,728	N	Y			

Notes:

1 - Cost allowance was calculated using $40,000 per benefited receptor in accordance to the NDOT Policy.

2 - Estimated cost was calculated based on $38 per square foot of wall constructed.

3 - Noise Reduction design Goal.

AREAS WITH NOISE *ABATEMENT*

Considered Soundwalls

Traffic noise analysis indicates five areas impacted by the proposed intersection improvement project:

- A residence along the westbound side of McCarran Boulevard west of Pyramid Way represented by Receptor R16;
- A residence at the northwest corner of McCarran Boulevard and Pyramid Way represented by Receptor R43;
- Residences along the southbound side of Pyramid Way south of Emerson Way represented by Receptors R45 to R47;
- A residence at the northwest corner of Pyramid Way and Emerson Way represented by Receptor R49; and,
- A daycare center along the southbound side of Pyramid Way opposite Mercy Court represented by Receptor R54.

In addition, if construction of the project requires the removal of any portions of the existing wall along eastbound McCarran Boulevard from Rock Boulevard to the east end of the residential development in this area, the removed portions will be replaced in-kind as part of project implementation. In areas where a row of homes would be acquired, 6-foot tall privacy walls would be constructed to provide separation between the residential neighborhoods and the roadway, as part of the Visual Resource mitigation action. While not an intended traffic noise mitigation measure, depending upon their location, privacy walls can abate traffic noise. The following soundwalls were considered as a means of abating the identified traffic noise impacts:

Soundwall S37: Soundwall S37 would be located along the westbound side of McCarran Boulevard at the right of way line between Stations 35+85 and 39+00. At a height of 8 feet, the wall would achieve NDOT acoustical feasibility criteria. Table 10 presents the predicted noise levels and barrier analysis results. Table 11 provides summary statistics for this soundwall. Figures A-2 and A-3 in Appendix A show the location of Soundwall S37. As an alternative, the wall could be wrapped northward along the eastern property line of this residence (2975 Pyramid Way) at Station 38+10.

Soundwall S79: Soundwall S79 would be located along the southbound side of Pyramid Way and the westbound side of McCarran Boulevard at the right of way line between Stations 40+35 (McCarran Boulevard) and 80+20 (Pyramid Way). At a height of 10 feet, the wall would achieve NDOT acoustical feasibility criteria. Table 10 presents the predicted noise levels and barrier analysis results. Table 11 provides summary statistics for this soundwall. Figure A-3 in Appendix A shows the location of Soundwall S79.

Soundwall S83: Soundwall S83 would be located along the southbound side of Pyramid Way at the right of way line between corridor Stations 82+95 and 84+95. It would replace an existing 6-foot-high property wall at this location. Near its northern terminus, it would wrap around the southwest corner of the intersection at Emerson Way. At its southernmost point along the right of way line, it would extend westward along the southern boundary of the southernmost protected residence (3170 Lagomarsino Drive). At a height of 10 feet, the soundwall would achieve NDOT acoustical feasibility criteria. This would not be the case if the soundwall

terminated at the right of way line and excluded the westward extensions. Table 10 presents the predicted noise levels and barrier analysis results (with westward extensions). Table 11 provides summary statistics for this soundwall. If Soundwall S83 needed to be constrained to the state right-of-way, it could not meet the acoustical feasibility criteria. Figures A-3 and A-4 in Appendix A shows the location of Soundwall S83.

Soundwall S85: Soundwall S85 would be located along the southbound side of Pyramid Way at the right of way line between Stations 85+50 and 86+30. It would replace the southern portion of an existing 7-foot-high property wall at this location. From its southernmost point along the right of way line, Soundwall S85 would extend westward along the property line of the protected residence (represented by Receptor R49). At a height of 8 feet, the soundwall would achieve NDOT acoustical feasibility criteria. This would not be the case if the soundwall terminated at the right of way line and excluded the westward extension. Table 10 presents the predicted noise levels and barrier analysis results (with westward extension). Table 11 provides summary statistics for this soundwall. If Soundwall S85 needed to be constrained to the state right-of-way, it would no longer provide feasible abatement at the noise-sensitive land use experiencing traffic noise impacts. Figures A-3 and A-4 in Appendix A show the location of Soundwall S85.

Soundwall S91: Soundwall S91 would be located along the southbound side of Pyramid Way at the right of way line between Stations 90+05 and 90+55. From its northernmost point along the right of way line, it would follow the northern property line to the west for approximately 20 feet. At its southernmost point, the soundwall would extend along the southern boundary of the protected property (3345 Pyramid Way). At a height of 6 feet, the soundwall would achieve NDOT acoustical feasibility criteria. This would not be the case if the soundwall terminated at the right of way line and excluded the westward extensions. Table 10 presents the predicted noise levels and barrier analysis results (with westward extensions). Table 11 provides summary statistics for this soundwall. If Soundwall S91 needed to be constrained to the state right-of-way, it would no longer provide feasible abatement. Figure A-4 in Appendix A shows the location of Soundwall S91.

Engineering Feasibility

NDOT's Traffic and Construction Noise Abatement Policy requires the engineering feasibility to be determined prior to final selection and design of soundwalls as required per FHWA guidelines. In review of the project site, overall budgetary constraints and development of the preliminary design for the evaluation of the build alternative, it has been determined that the soundwalls considered as part of the build alternative are feasible from an engineering perspective. Factors included in this review and determination included safety considerations, site topography, access to businesses and residences, roadway compatibility and drainage impacts, utility conflicts and relocation requirements, maintenance considerations, aesthetics, and potential for additional enhancements to private property. Costs of the soundwalls are anticipated to be in line with typical concrete noise barrier wall prices. Site conditions are typical for spread footing foundations, with no special conditions that would increase the wall unit price or the complexity/difficulty of construction. For any barriers selected for final design, such design should meet the acoustical benefit predicted in this preliminary assessment and in accordance with the NDOT Structure Division's Structures Manual (NDOT, 2008).

Cost-Reasonableness Assessment

Soundwall S37: At its minimum feasible height or any greater height, this soundwall would benefit one receptor. Therefore, the maximum cost allowance for this soundwall would be $40,000. Based on a cost rate of $38 per square foot, the cost of constructing the soundwall at its minimum feasible height would be approximately $96,000. Accordingly, Soundwall S37 is not cost-reasonable, cannot be proposed, and the abatement measure is not eligible for Federal funding.

Soundwall S79: At its minimum feasible height or any greater height, this soundwall would benefit one receptor. Therefore, the maximum cost allowance for this soundwall would be $40,000. Based on a cost rate of $38 per square foot, the cost of constructing the soundwall at its minimum feasible height would be approximately $108,300. Accordingly, Soundwall S79 is not cost-reasonable, cannot be proposed, and the abatement measure is not eligible for Federal funding.

Soundwall S83: At its minimum feasible height or any greater height, this soundwall would benefit three receptors. Therefore, the maximum cost allowance for this soundwall would be $120,000. Based on a cost rate of $38 per square foot, the cost of constructing the soundwall at its minimum feasible height would be approximately $98,420. Therefore, Soundwall S83 is cost-reasonable at its minimum feasible height. Greater heights were evaluated to determine if the NRG could be achieved while retaining cost-reasonableness. The NRG can be achieved at a soundwall height of 8-foot, and Soundwall S83 would remain cost-reasonable at that height. Accordingly, Soundwall S83 is recommended at 8- feet high, and the abatement measure is eligible for Federal funding.

Soundwall S85: At its minimum feasible height or any greater height, this soundwall would benefit one receptor. Therefore, the maximum cost allowance for this soundwall would be $40,000. Based on a cost rate of $38 per square foot, the cost of constructing the soundwall at its minimum feasible height would be approximately $51,680. Accordingly, Soundwall S85 is not cost-reasonable, cannot be proposed, and the abatement measure is not eligible for Federal funding.

Soundwall S91: At its minimum feasible height or any greater height, this soundwall would benefit one receptor. Therefore, the maximum cost allowance for this soundwall would be $40,000. Based on a cost rate of $38 per square foot, the cost of constructing the soundwall at its minimum feasible height would be approximately $35,796. Therefore, Soundwall S91 is cost-reasonable at its minimum feasible height, and greater heights were evaluated to determine if the NRG could be achieved while retaining cost-reasonableness. The NRG cannot be achieved at a soundwall height of 8 feet or taller. Soundwall S91 is recommended at 6-foot high, and the abatement measure is eligible for Federal funding.

AREAS WITH IMPACTS BUT WITHOUT NOISE ABATEMENT

No locations were identified where traffic noise impacts are predicted but cannot be feasibly abated, assuming that soundwalls can be extended onto City right-of-way and private property as required to protect Receptors R47 and R49 (city right-of-way) and Receptors R45 and R54 (private property).

However, only two of the five feasible soundwalls considered in this analysis were determined to be cost-reasonable. Abatement implementation is limited to cost-reasonable soundwalls and the following areas are not eligible for traffic noise abatement:

- A residence along the westbound side of McCarran Boulevard west of Pyramid Way represented by Receptor R16.
- A residence at the northwest corner of McCarran Boulevard and Pyramid Way represented by Receptor R43.
- A residence at the northwest corner of Pyramid Way and Emerson Way represented by Receptor R49.

LOCATIONS WHERE AREAS OF FREQUENT HUMAN USE ARE LIMITED TO INTERIORS

Four modeled receptors – Receptors R8, R42, R44, and R69 – represent church facilities where no exposed outdoor areas of frequent human use were identified. At these locations, preliminary predictions of interior noise levels were compared with the approach/exceed threshold for Land Use Category D. That threshold is 15 dB below the corresponding threshold for Category C land uses. Interior noise levels were predicted by subtracting the assumed outdoor-to-indoor noise level reduction (OILR) from the associated exterior noise level predictions. Assumed OILRs were based on noise reduction factors published by FHWA (FHWA, 2011).

Photographic imagery was evaluated for each of these facilities to confirm exterior evidence of effective heating, ventilation, and air conditioning (HVAC) systems and to assess the general appearance of facility windows and their context within the relevant building structures. The following was observed:

- Sparks Seventh Day Adventist (Receptor R8): Roof-mounted HVAC equipment is present. Windows are present within the south-facing facades of both the worship space and portions of the building likely dedicated to supporting activities. If the windows within the south-facing facade of the worship space are operable, it is reasonable to expect that they are kept closed almost all of the time that noise-sensitive activities occur within that space. It is also reasonable to expect that windows within portions of the south-facing facade of the supporting activities space are also kept closed almost all of the time that noise-sensitive activities occur there. Accordingly, an OILR of 20 dB was applied at Receptor R8.
- Church of Christ Sierra Nevada (Receptor R42): Roof- and external ground-mounted HVAC equipment is present. If the east-facing windows are operable, it is reasonable to expect that they are kept closed almost all of the time that noise-sensitive activities occur within that space. Accordingly, an OILR of 20 dB was applied at Receptor R42. At this location, even if the east-facing windows were left open, the resulting 10 dB OILR would be sufficient to maintain traffic noise levels within residential interiors below the 51 dBA approach/exceed threshold.

- Immaculate Conception Church (east building, represented by Receptor R44): Roof-mounted HVAC equipment is present. If the south- and/or east-facing windows are operable, it is reasonable to expect that they are kept closed almost all of the time that noise-sensitive activities occur within that space. Accordingly, an OILR of 20 dB was applied at Receptor R44.
- Church of Christ (Receptor R69): There is no clear exterior photographic evidence of HVAC equipment. Accordingly, west-facing windows are not assumed to be kept closed almost all of the time that noise-sensitive activities occur within that space, and an OILR of 10 dB was assumed.

8.0 CONSTRUCTION NOISE

Noise at the construction sites will be intermittent and intensity will vary. The degree of construction noise impacts may vary for different areas of the project site and depending on the construction activities. While variations in construction schedule and activities are traditionally left to the contractor's discretion, nighttime construction has not been anticipated for this project.

Long-term noise exposure descriptors are difficult to quantify due to the intermittent nature of construction noise. Highway construction is accomplished in several different phases. During the construction period, some of the sensitive receptors that are close to the intersection and roadways may be exposed to high noise levels. Effective noise control during the construction of a project means minimizing noise disturbances to the surrounding community. A combination of techniques including equipment noise control and administrative measures can be selected to provide the most effective means of mitigation. Contract documents shall address means to minimize noise associated with construction activities and may include specifications addressing hours of operation and noise-level limits, performance of proper maintenance on construction equipment, and the placement of stationary equipment.

9.0 REFERENCES

FHWA, 1996. U.S. Department of Transportation, Federal Highway Administration (FHWA), Office of Environment and Planning. *Measurement of Highway-Related Noise*. FHWA-DP-96-046. May.

FHWA, 2004. FHWA. *FHWA Traffic Noise Model*. TNM 2.5. February.

FHWA, 2010. 23 CFR Part 772, *Procedures for Abatement of Highway Traffic Noise and Construction Noise.* 75 FR 39820, July 13.

FHWA, 2011. Highway Traffic Noise: Analysis and Abatement Guidance. June 2010 Revised January 2011.

NDOT, 2005. Nevada Department of Transportation (NDOT). *Urban Vehicle Distribution And Average ESAL's By Roadway Functional Classification*. April 14.

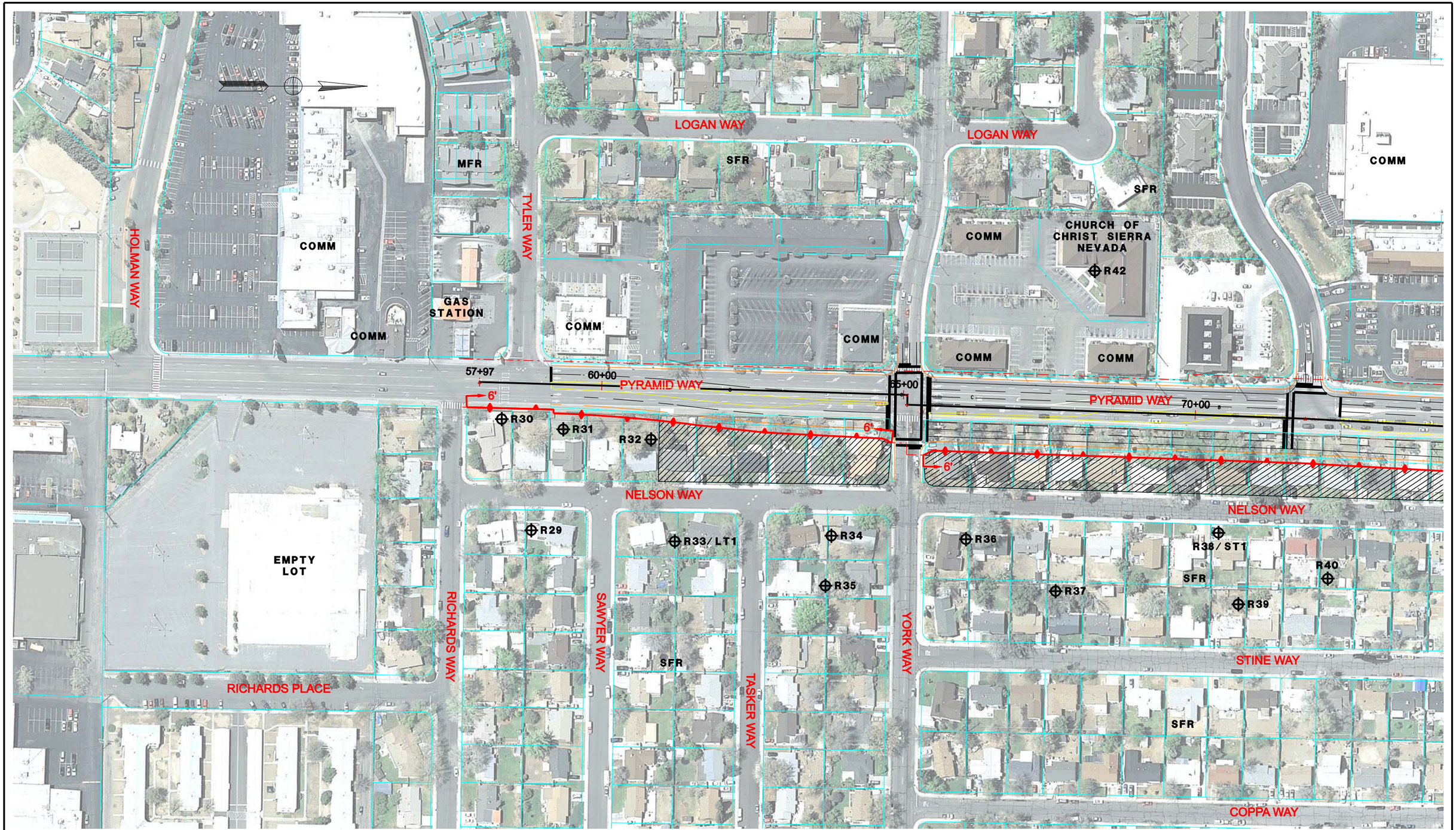
NDOT, 2008. NDOT, Structures Division. *Structures Manual.*

NDOT, 2011. NDOT, Environmental Services Division. *Traffic and Construction Noise Abatement Policy.* April 18.

.

APPENDIX A:

RECEPTOR AND NOISE BARRIER LOCATIONS



LEGEND

- CAL - CALIBRATION SITE
- LT - LONGTERM MEASUREMENT
- ST - SHORTTERM MEASUREMENT
- RXX - NOISE RECEIVER SITE
- EXISTING WALL
- CONSIDERED SOUNDWALL
- RECOMMENDED SOUNDWALL
- PRIVACY WALL
- SFR - SINGLE FAMILY RESIDENCE
- COMM - COMMERCIAL
- ACQUIRED PROPERTY -

1in : 150ft

0 ft 100ft 150ft 200ft

PARSONS
100 WEST WALNUT ST.
PASADENA, CA 91124
(626) 440-6100

PYRAMID/ MCCARRAN PROJECT NOISE RECEPTOR & BARRIER LOCATIONS

SEPTEMBER 12, 2012 | FIGURE A-1

WEDEKIND ROAD
SKYRIDGE LANE
VALLEY FORGE WAY
HOLMAN WAY
BUNKER HILL LANE
EMERSON WAY
SFR
R15
R9
SFR
SFR
R10
SFR
R11
IMMACULATE CONCEPTION CHURCH
R14
R12/ ST2A
R13/ ST2B
Existing 5' property wall
SFR
8'
S37
SPARKS SEVENTH DAY ADVENTIST
R8
Existing 8ft property wall
15+00
20+00
McCARRAN BOULEVARD
25+00
30+00
35+00
Existing 8ft - 12ft property wall
R1
R3
R4
R5/ LT2
R6
SFR
GAULT WAY
Existing 8ft property walls
R2
R7
COMM
ROCK BOULEVARD
14TH STREET
SFR
11TH STREET
DODSON WAY
Existing 8ft - 12ft soundwall

LEGEND

- CAL - CALIBRATION SITE
- LT - LONGTERM MEASUREMENT
- ST - SHORTTERM MEASUREMENT
- RXX - NOISE RECEIVER SITE
- EXISTING WALL
- CONSIDERED SOUNDWALL
- RECOMMENDED SOUNDWALL
- PRIVACY WALL
- SFR - SINGLE FAMILY RESIDENCE
- COMM - COMMERCIAL
- ACQUIRED PROPERTY

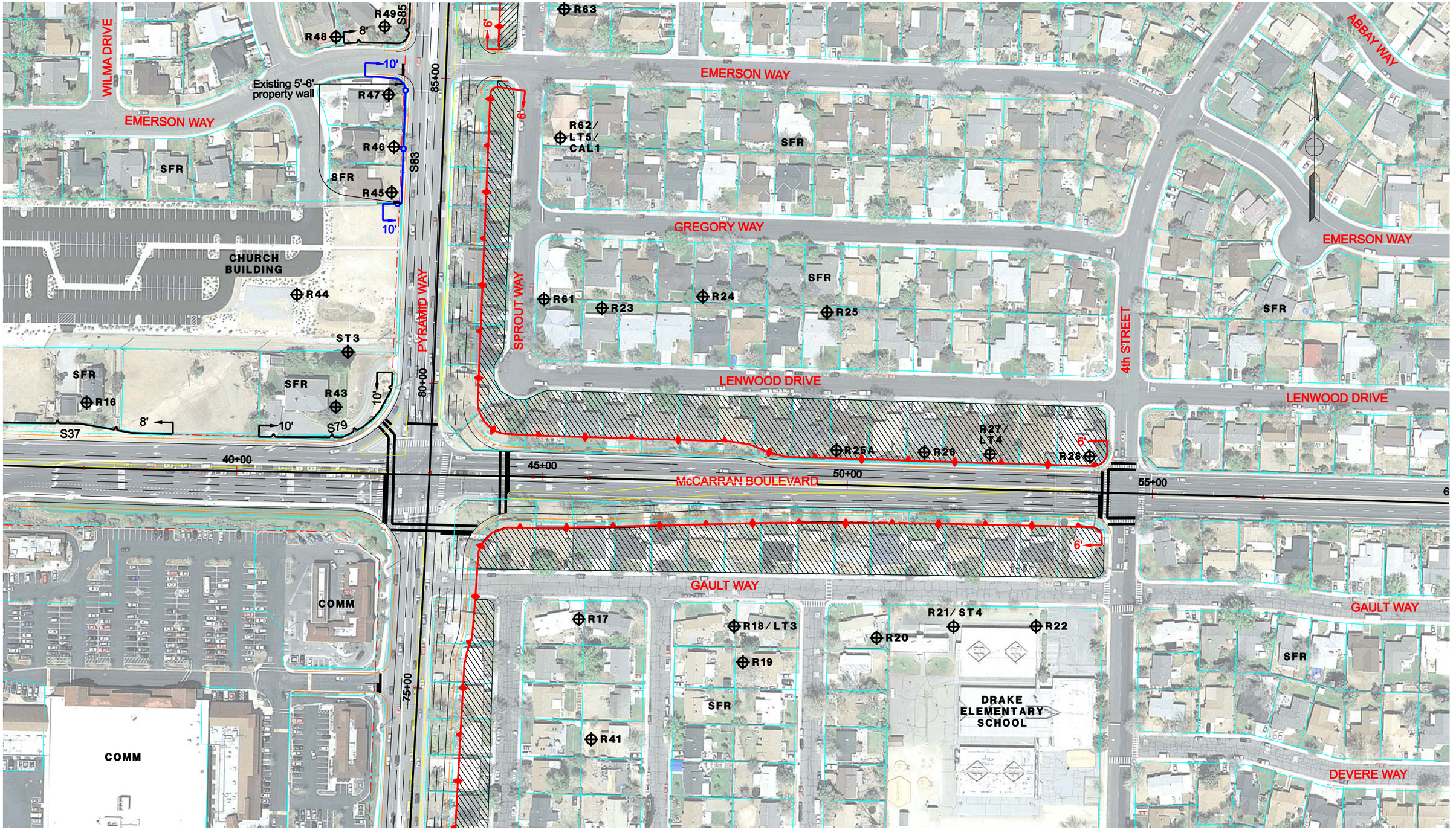
1in : 150ft

0 ft 100ft 150ft 200ft

PARSONS
100 WEST WALNUT ST.
PASADENA, CA 91124
(626) 440-6100

PYRAMID/ MCCARRAN PROJECT NOISE RECEPTOR & BARRIER LOCATIONS

SEPTEMBER 12, 2012 | FIGURE A-2



LEGEND

- CAL - CALIBRATION SITE
- LT - LONGTERM MEASUREMENT
- ST - SHORTTERM MEASUREMENT
- RXX - NOISE RECEIVER SITE
- EXISTING WALL
- CONSIDERED SOUNDWALL
- RECOMMENDED SOUNDWALL
- PRIVACY WALL
- SFR - SINGLE FAMILY RESIDENCE
- COMM - COMMERCIAL
- ACQUIRED PROPERTY

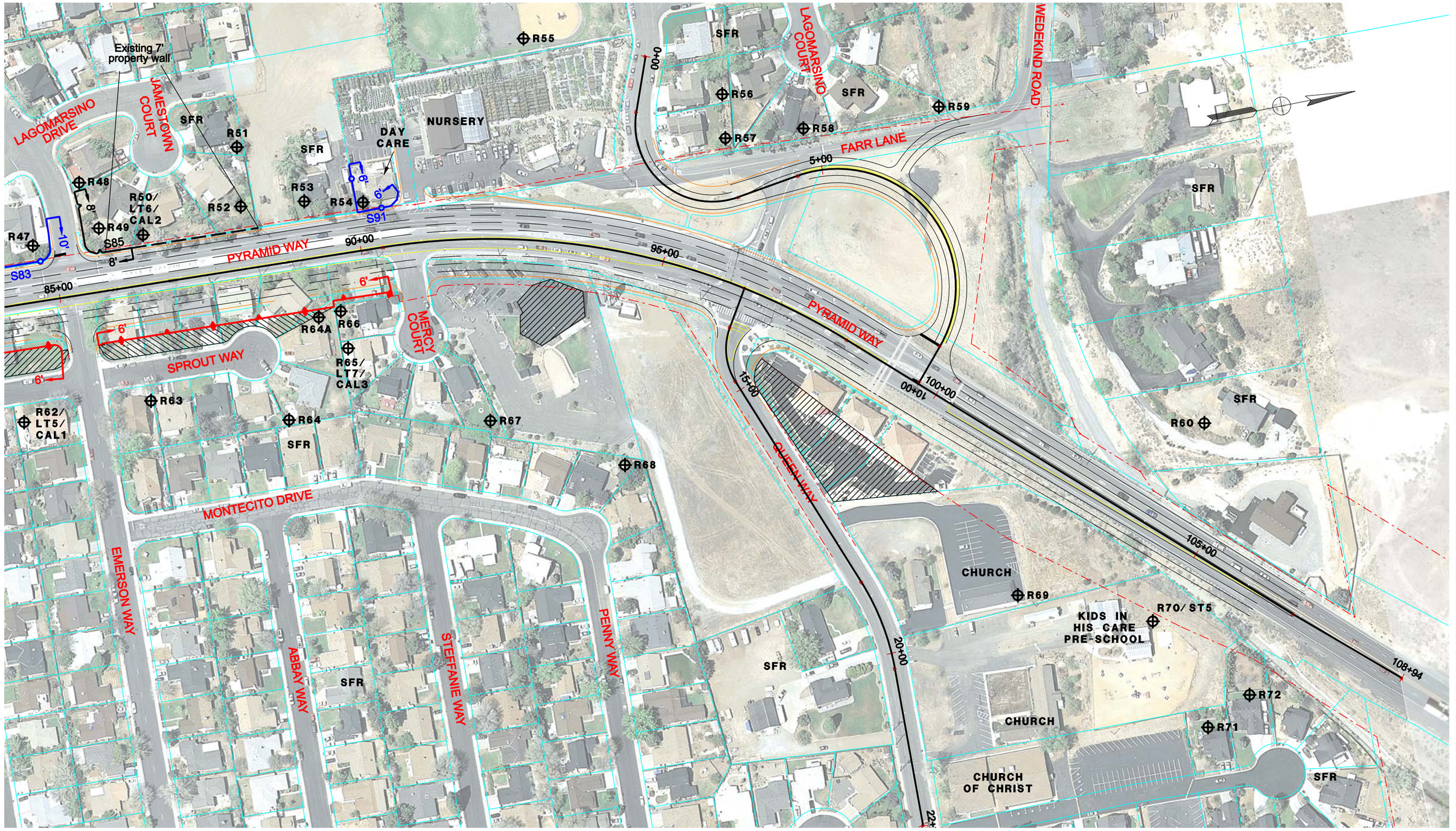
1in : 150ft

0 ft 100ft 150ft 200ft

PARSONS
100 WEST WALNUT ST.
PASADENA, CA 91124
(626) 440-6100

PYRAMID/ MCCARRAN PROJECT NOISE RECEPTOR & BARRIER LOCATIONS

SEPTEMBER 12, 2012 | FIGURE A-3



LEGEND

- CAL - CALIBRATION SITE
- LT - LONGTERM MEASUREMENT
- ST - SHORTTERM MEASUREMENT
- RXX - NOISE RECEIVER SITE
- EXISTING WALL
- CONSIDERED SOUNDWALL
- RECOMMENDED SOUNDWALL
- PRIVACY WALL
- SFR - SINGLE FAMILY RESIDENCE
- COMM - COMMERCIAL
- ACQUIRED PROPERTY

1in : 150ft

0 ft 100ft 200ft 150ft

PARSONS
100 WEST WALNUT ST.
PASADENA, CA 91124
(626) 440-6100

PYRAMID/MCCARRAN PROJECT NOISE RECEPTOR & BARRIER LOCATIONS

SEPTEMBER 12, 2012 | FIGURE A-4

APPENDIX B:

NOISE MEASUREMENT FIELD FORMS AND LONG-TERM MEASUREMENT DATA

FIELD SURVEY FORM

PROJECT: Pyramid/McCarran

ENGINEER: M. Meyer

DATE: 5/2

MEASUREMENT ADDRESS: 2220 Nelson Way

CITY: Sparks, NV

☒ Single-Family ☐ Multi-Family ☐ School ☐ Recreational ☐ Commercial ☐ Church

SITE NO.: LT 1

SOUND LEVEL METER:
☐ LD-870 ☐ LD-820 ☐ B&K-2238
☐ LD-824 ☒ LD-812 ☐ B&K-2250
☐ LD-2900 ☐ _____
SERIAL #: 0638

MICROPHONE:
☑ 1/2-INCH ☐ 1-INCH
☑ WIND SCREEN
MAKE AND MODEL: 2560
SERIAL #: 5159

PRE AMP:
☐ LD-900 ☐ ZC-0030
☒ LD-828 ☐ ZC-0032
☐ LD-824 ☐ _____
SERIAL #: 1901

CALIBRATOR:
☒ LD CA250 ☐ LD CA200
☐ B&K 4231 ☐ _____
S/N 7809

Freq, Hz.
☑ 250
☐ 1k
☐ 84
☐ ___

CALIBRATION RECORD:
B&K SLM: Input, dB / Sens.(mV/Pa) / Δ from Prev., dB /Time
LD SLM: Input, dB / Reading, dB / Offset, dB / Time
Before 114.0, 114.0, 8.5, 5:07
After 114.0, 113.9, 8.5, 9:35

METER SETTINGS:
☒ A-WTD ☐ LINEAR ☒ SLOW ☐ 1/1 OCT ☑ INTERVALS 20 - MINUTE
☐ C-WTD ☐ IMPULSE ☐ FAST ☐ 1/3 OCT ☑ L_N PERCENTILE VALUES

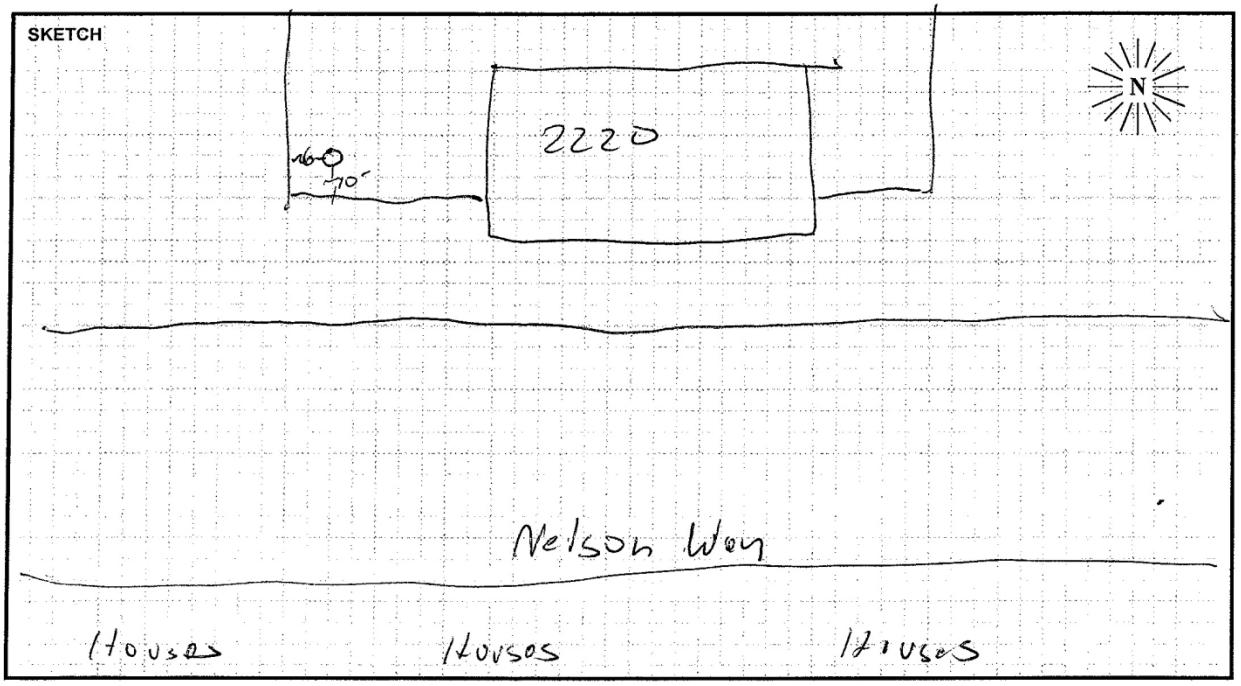
NOTES:
SYSTEM PWR: ☐ BAT ☐ AC
(observations at start of measurement)
TEMP: 45 °F R.H.: 25 %
WIND SPEED: _____ MPH
TOWARD (DIR): _____
SKIES: Cloudy
CAMERA _____
PHOTO NOs. _____

NOTES:
Dist. to Center of Nearest Lane _____ ☐ Video ☐ Radar
Counts AT MT HT

MEAS. TYPE:
☒ Long Term
☐ Short Term

DATE	START TIME	STOP TIME	L_{MIN}	L_{99}	L_{90}	L_{50}	L_{25}	L_{10}	L_{01}	L_{MAX}	L_{EQ}	NOTES:
5/2	5:09											
5/4		9:32										

SKETCH

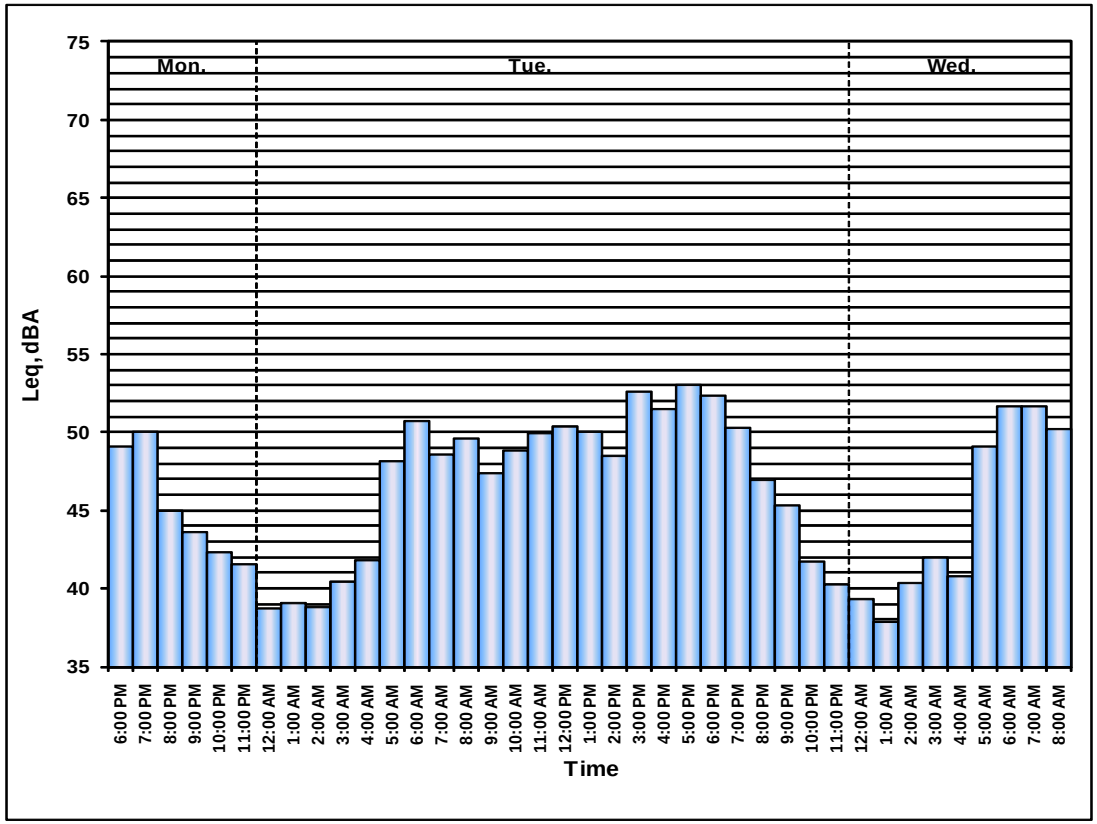


PARSONS

Site LT1 Hourly Noise Levels, $L_{eq}(h)$

Location: 2220 Nelson Way, Sparks
Position: Side yard
Sources: Traffic on Pyramid Highway
Date: 05/02/11 - 05/04/11 **Notes:** See attached Noise Measurement Form.

TIME	5/2-5/3 $L_{eq(h)}$ dBA	5/3-5/4 $L_{eq(h)}$ dBA
06:00 - 07:00 PM	49	52
07:00 - 08:00 PM	50	50
08:00 - 09:00 PM	45	47
09:00 - 10:00 PM	44	45
10:00 - 11:00 PM	42	42
11:00 - 12:00 AM	42	40
12:00 - 01:00 AM	39	39
01:00 - 02:00 AM	39	38
02:00 - 03:00 AM	39	40
03:00 - 04:00 AM	40	42
04:00 - 05:00 AM	42	41
05:00 - 06:00 AM	48	49
06:00 - 07:00 AM	51	52
07:00 - 08:00 AM	49	52
08:00 - 09:00 AM	50	50
09:00 - 10:00 AM	47	
10:00 - 11:00 AM	49	
11:00 - 12:00 PM	50	
12:00 - 01:00 PM	50	
01:00 - 02:00 PM	50	
02:00 - 03:00 PM	49	
03:00 - 04:00 PM	53	
04:00 - 05:00 PM	52	
05:00 - 06:00 PM	53	



FIELD SURVEY FORM

PROJECT: Pyramid/McCarran

ENGINEER: M. Meyer

DATE: 5/2

MEASUREMENT ADDRESS: 1200 Gould Way

CITY: Sparks, NV

☒ Single-Family ☐ Multi-Family ☐ School ☐ Recreational ☐ Commercial ☐ Church

SITE NO.: LT2

SOUND LEVEL METER:
☐ LD-870 ☒ LD-820 ☐ B&K-2238
☐ LD-824 ☐ LD-812 ☐ B&K-2250
☐ LD-2900 ☐ _____
SERIAL #: 1642

MICROPHONE:
☑ 1/2-INCH ☐ 1-INCH
☑ WIND SCREEN
MAKE AND MODEL: 3560
SERIAL #: 3165

PRE AMP:
☐ LD-900 ☐ ZC-0030
☒ LD-828 ☐ ZC-0032
☐ LD-824 ☐ _____
SERIAL #: 2492

CALIBRATOR:
☒ LD CA250 ☐ LD CA200
☐ B&K 4231 ☐ _____
S/N 7309

Freq, Hz.
☒ 250
☐ 1k
☐ 84
☐ ___

CALIBRATION RECORD:
B&K SLM: Input, dB / Sens.(mV/Pa) / Δ from Prev., dB /Time
LD SLM: Input, dB / Reading, dB / Offset, dB / Time
Before 114.0, 114.0, 7.6, 10:13
After 114.0, 114.0, 7.8, 9:21

METER SETTINGS:
☒ A-WTD ☐ LINEAR ☒ SLOW ☐ 1/1 OCT ☒ INTERVALS 20 - MINUTE
☐ C-WTD ☐ IMPULSE ☐ FAST ☐ 1/3 OCT ☑ L_N PERCENTILE VALUES

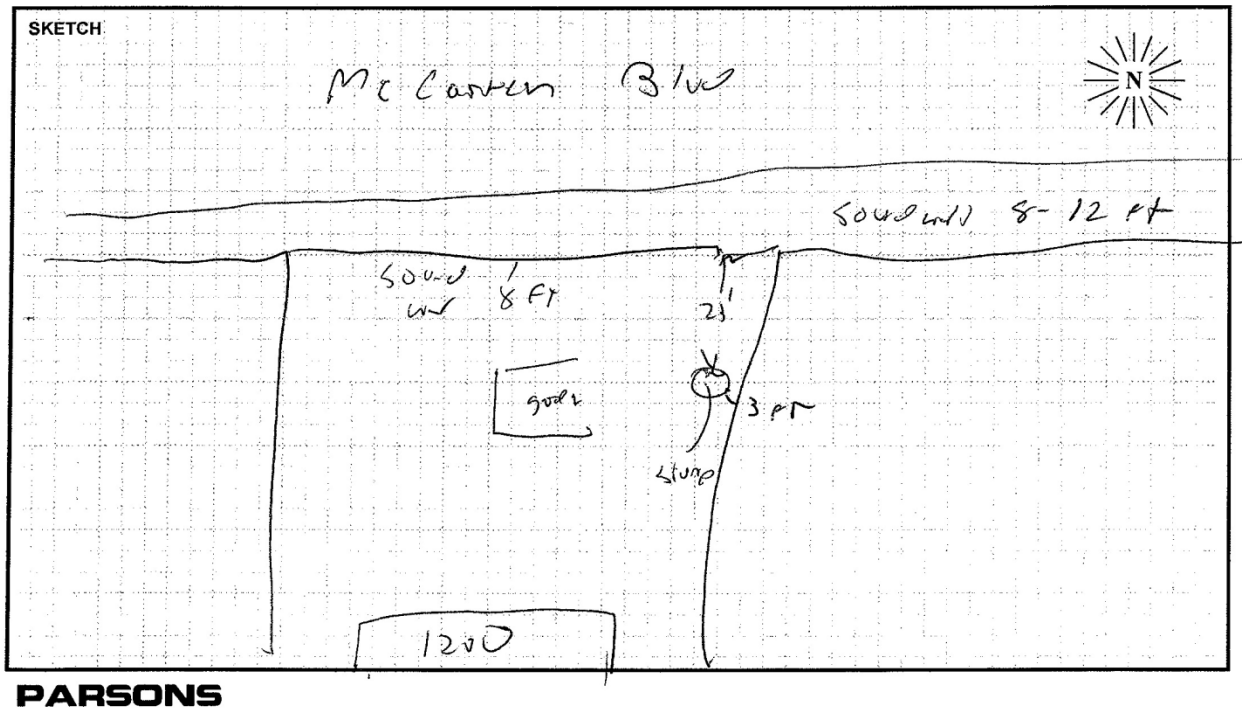
NOTES:
SYSTEM PWR: ☒ BAT ☐ AC
(observations at start of measurement)
TEMP: 70 °F R.H.: 23 %
WIND SPEED: _____ MPH
TOWARD (DIR): _____
SKIES: Cloudy
CAMERA _____
PHOTO NOs. _____

NOTES: Dist. to Center of Nearest Lane _____ ☐ Video ☐ Radar Counts AT MT HT

MEAS. TYPE: ☒ Long Term ☐ Short Term

DATE	START TIME	STOP TIME	L_{MIN}	L_{99}	L_{90}	L_{50}	L_{25}	L_{10}	L_{01}	L_{MAX}	L_{EQ}	NOTES:
5/2	2:16											
5/4		9:18										

SKETCH

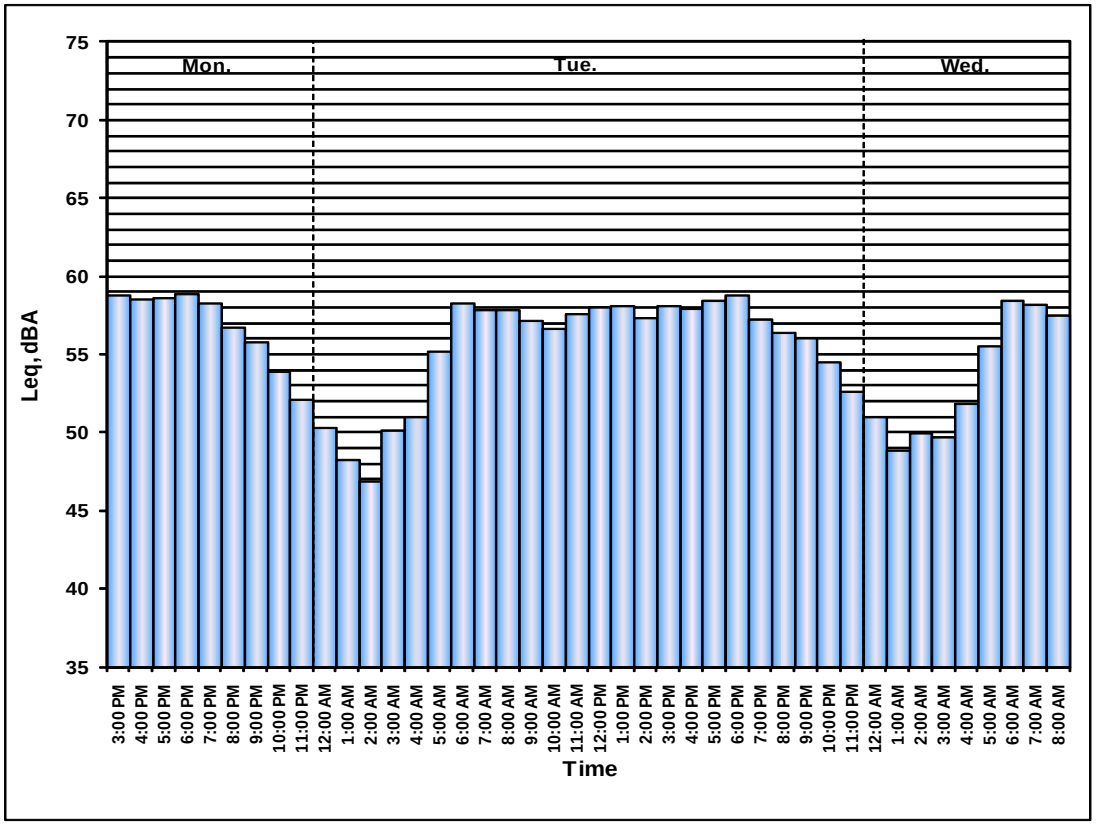


PARSONS

Site LT2 Hourly Noise Levels, $L_{eq}(h)$

Location: 1200 Gault Way, Sparks
Position: Backyard
Sources: Traffic on McCarran Boulevard
Date: 05/02/11 - 05/04/11 **Notes:** See attached Noise Measurement Form.

TIME	5/2-5/3 $L_{eq(h)}$ dBA	5/3-5/4 $L_{eq(h)}$ dBA
03:00 - 04:00 PM	59	58
04:00 - 05:00 PM	59	58
05:00 - 06:00 PM	59	58
06:00 - 07:00 PM	59	59
07:00 - 08:00 PM	58	57
08:00 - 09:00 PM	57	56
09:00 - 10:00 PM	56	56
10:00 - 11:00 PM	54	55
11:00 - 12:00 AM	52	53
12:00 - 01:00 AM	50	51
01:00 - 02:00 AM	48	49
02:00 - 03:00 AM	47	50
03:00 - 04:00 AM	50	50
04:00 - 05:00 AM	51	52
05:00 - 06:00 AM	55	56
06:00 - 07:00 AM	58	59
07:00 - 08:00 AM	58	58
08:00 - 09:00 AM	58	58
09:00 - 10:00 AM	57	
10:00 - 11:00 AM	57	
11:00 - 12:00 PM	58	
12:00 - 01:00 PM	58	
01:00 - 02:00 PM	58	
02:00 - 03:00 PM	57	



FIELD SURVEY FORM

PROJECT: Pyramid/McCarran

ENGINEER: M. Meyer

DATE: 5/2

MEASUREMENT ADDRESS: 655 Gault Way

CITY: Sparks, NV

☑ Single-Family ☐ Multi-Family ☐ School ☐ Recreational ☐ Commercial ☐ Church

SITE NO.: 273

SOUND LEVEL METER:
☐ LD-870 ☒ LD-820 ☐ B&K-2238
☐ LD-824 ☐ LD-812 ☐ B&K-2250
☐ LD-2900 ☐ _____
SERIAL #: 1668

MICROPHONE:
☑ 1/2-INCH ☐ 1-INCH
☑ WIND SCREEN
MAKE AND MODEL: 2560
SERIAL #: 2627

PRE AMP:
☐ LD-900 ☐ ZC-0030
☒ LD-828 ☐ ZC-0032
☐ LD-824 ☐ _____
SERIAL #: 2656

CALIBRATOR:
☒ LD CA250 ☐ LD CA200
☐ B&K 4231 ☐ _____
S/N 7389

Freq, Hz.
☑ 250
☐ 1k
☐ 84
☐ ___

CALIBRATION RECORD:
B&K SLM: Input, dB / Sens.(mV/Pa) / Δ from Prev., dB /Time
LD SLM: Input, dB / Reading, dB / Offset, dB / Time
Before 114 , 114.0 , 7.5 , 12:30
After 114.0 , 114.1 , 7.5 , 11:47

METER SETTINGS:
☒ A-WTD ☐ LINEAR ☑ SLOW ☐ 1/1 OCT ☑ INTERVALS 20 - MINUTE
☐ C-WTD ☐ IMPULSE ☐ FAST ☐ 1/3 OCT ☑ L_N PERCENTILE VALUES

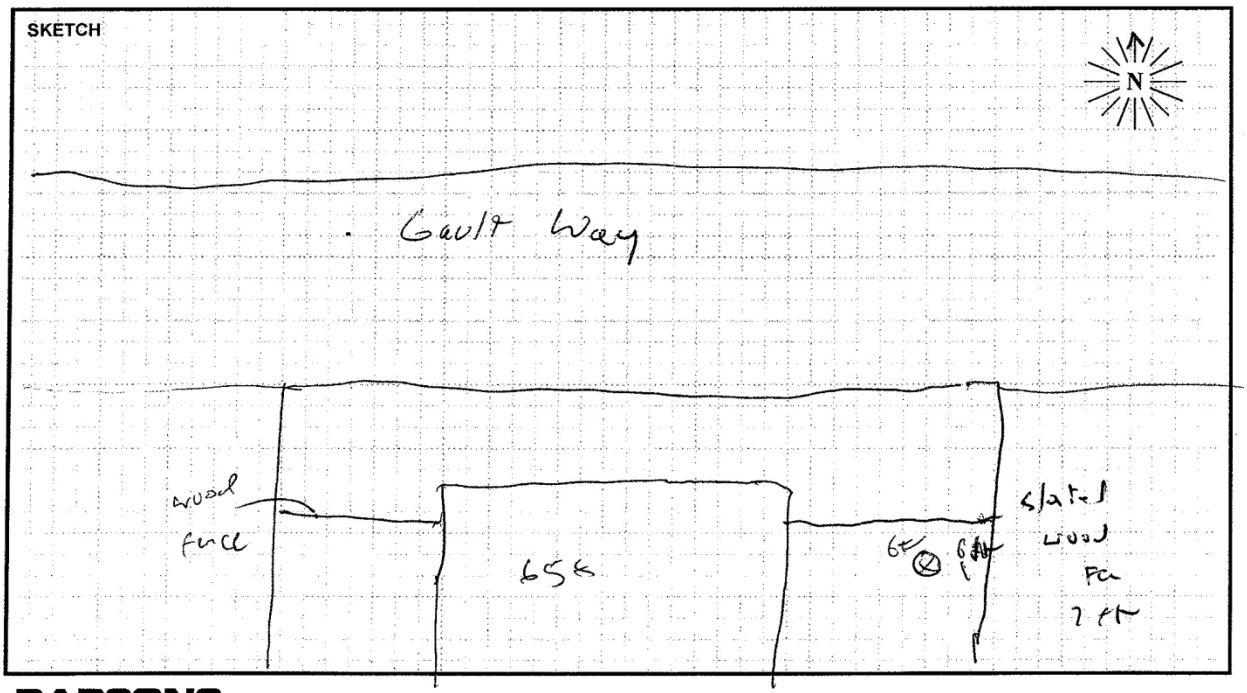
NOTES:
(observations at start of measurement)
TEMP: 79 °F R.H.: 21 %
WIND SPEED: _____ MPH
TOWARD (DIR): _____
SKIES: _____
CAMERA _____
PHOTO NOs. _____

NOTES: Dist. to Center of Nearest Lane _____ ☐ Video ☐ Radar Counts AT MT HT

MEAS. TYPE: ☒ Long Term ☐ Short Term

DATE	START TIME	STOP TIME	L_{MIN}	L_{99}	L_{90}	L_{50}	L_{25}	L_{10}	L_{01}	L_{MAX}	L_{EQ}	NOTES:
5/2	12:52											
5/4		4:28										Battery dropout

SKETCH

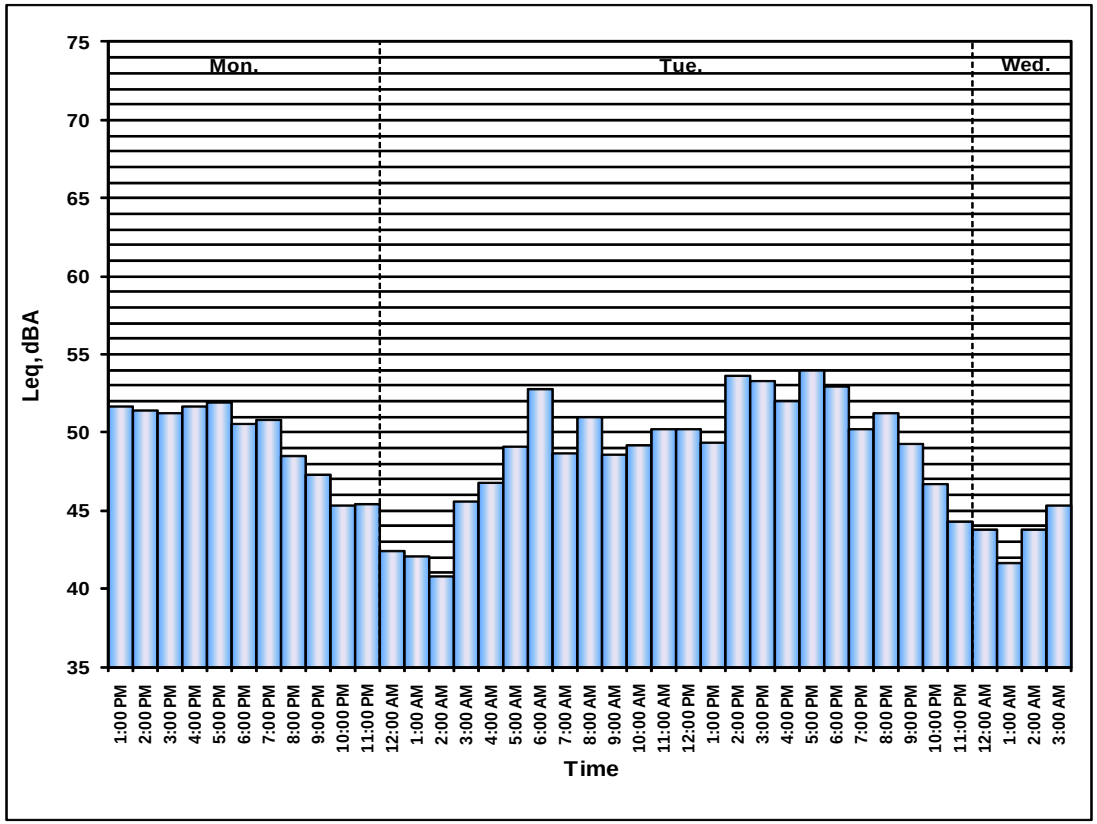


PARSONS

Site LT3 Hourly Noise Levels, $L_{eq}(h)$

Location: 655 Gault Way, Sparks
Position: Side yard
Sources: Traffic on McCarran Boulevard
Date: 05/02/11 - 05/04/11 **Notes:** See attached Noise Measurement Form.

TIME	5/2-5/3 $L_{eq(h)}$ dBA	5/3-5/4 $L_{eq(h)}$ dBA
01:00 - 02:00 PM	52	49
02:00 - 03:00 PM	51	54
03:00 - 04:00 PM	51	53
04:00 - 05:00 PM	52	52
05:00 - 06:00 PM	52	54
06:00 - 07:00 PM	51	53
07:00 - 08:00 PM	51	50
08:00 - 09:00 PM	49	51
09:00 - 10:00 PM	47	49
10:00 - 11:00 PM	45	47
11:00 - 12:00 AM	45	44
12:00 - 01:00 AM	42	44
01:00 - 02:00 AM	42	42
02:00 - 03:00 AM	41	44
03:00 - 04:00 AM	46	45
04:00 - 05:00 AM	47	
05:00 - 06:00 AM	49	
06:00 - 07:00 AM	53	
07:00 - 08:00 AM	49	
08:00 - 09:00 AM	51	
09:00 - 10:00 AM	49	
10:00 - 11:00 AM	49	
11:00 - 12:00 PM	50	
12:00 - 01:00 PM	50	



FIELD SURVEY FORM

PROJECT: Pyramid/McCarran		ENGINEER: M. Meyer	DATE: 5/2
MEASUREMENT ADDRESS: 465 Lenwood	CITY: Sparks, NV	☑ Single-Family ☐ Multi-Family ☐ School ☐ Recreational ☐ Commercial ☐ Church	SITE NO.: 254

SOUND LEVEL METER:
☐ LD-870 ☒ LD-820 ☐ B&K-2238
☐ LD-824 ☐ LD-812 ☐ B&K-2250
☐ LD-2900 ☐ _____
SERIAL #: 1686

MICROPHONE:
☒ 1/2-INCH ☐ 1-INCH
☒ WIND SCREEN
MAKE AND MODEL: 2560
SERIAL #: 2722

PRE AMP:
☐ LD-900 ☐ ZC-0030
☒ LD-828 ☐ ZC-0032
☐ LD-824 ☐ _____
SERIAL #: 2578

CALIBRATOR:
☒ LD CA250 ☐ LD CA200
☐ B&K 4231 ☐ _____
S/N 7309

Freq, Hz.
☑ 250
☐ 1k
☐ 84
☐ ___

CALIBRATION RECORD:
B&K SLM: Input, dB / Sens.(mV/Pa) / Δ from Prev., dB /Time
LD SLM: Input, dB / Reading, dB / Offset, dB / Time
Before 114.2, 114.0, 7.7, 12.8
After 114.1, 113.9, 7.7, 9:53

NOTES:
SYSTEM PWR: ☒ BAT ☐ AC
(observations at start of measurement)
TEMP: 79 °F R.H.: 21 %
WIND SPEED: _____ MPH
TOWARD (DIR): _____
SKIES: _____
CAMERA _____
PHOTO NOs. _____

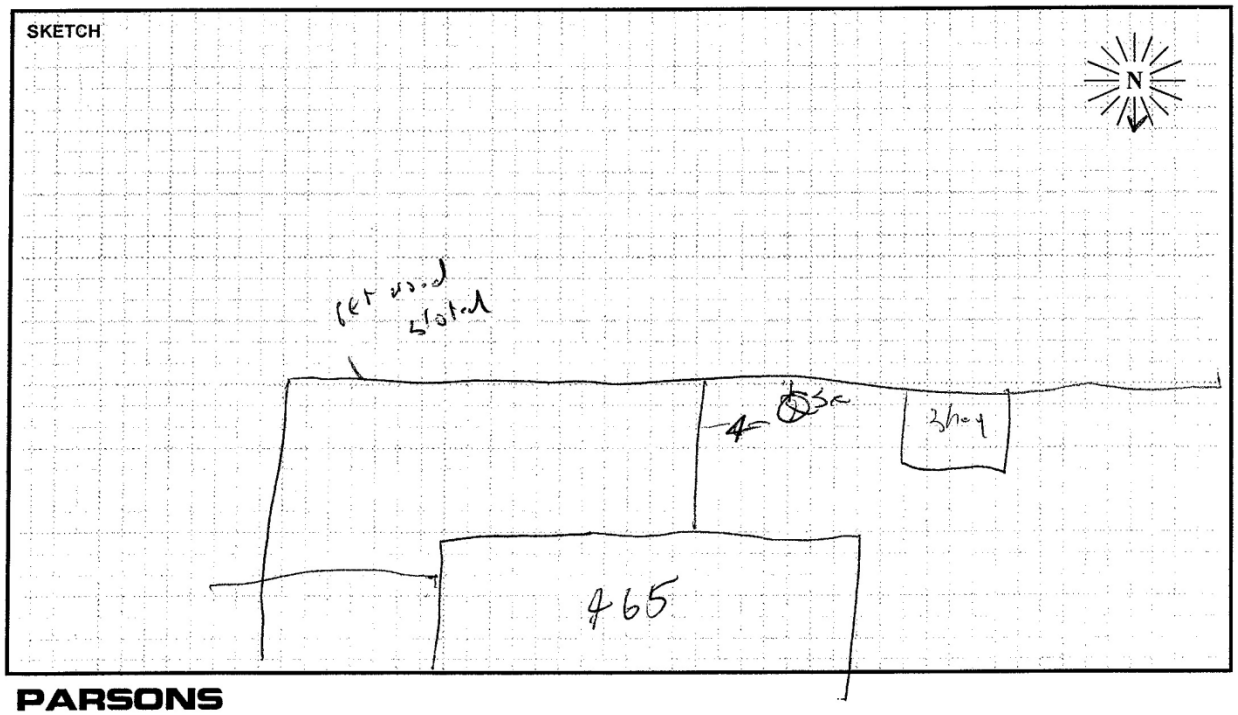
METER SETTINGS:
☒ A-WTD ☐ LINEAR ☒ SLOW ☐ 1/1 OCT ☑ INTERVALS 20 - MINUTE
☐ C-WTD ☐ IMPULSE ☐ FAST ☐ 1/3 OCT ☑ L_N PERCENTILE VALUES

NOTES: Dist. to Center of Nearest Lane _____ ☐ Video ☐ Radar Counts AT MT HT

MEAS. TYPE: ☒ Long Term ☐ Short Term

DATE	START TIME	STOP TIME	L_{MIN}	L_{99}	L_{90}	L_{50}	L_{25}	L_{10}	L_{01}	L_{MAX}	L_{EQ}	NOTES:
5/2	11:35											
5/2		9:49										

SKETCH

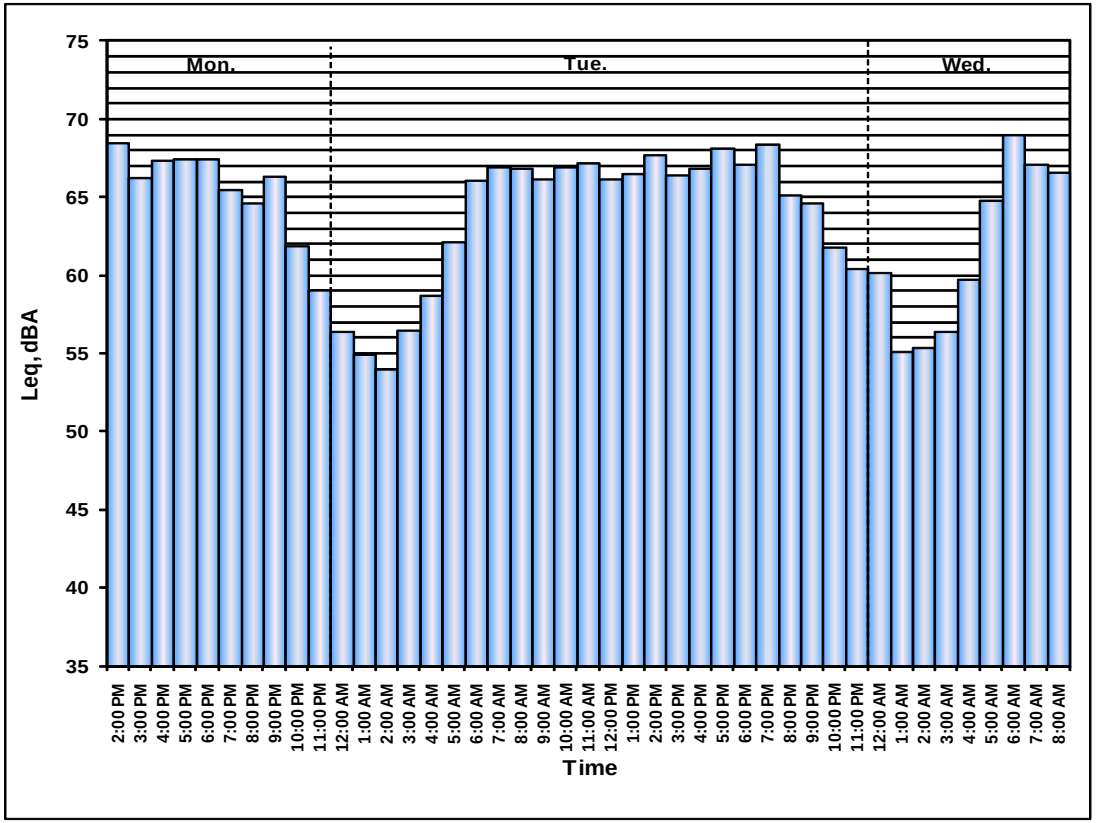


PARSONS

Site LT4 Hourly Noise Levels, $L_{eq}(h)$

Location: 465 Lenwood Drive, Sparks
Position: Backyard
Sources: Traffic on McCarran Boulevard
Date: 05/02/11 - 05/04/11 **Notes:** See attached Noise Measurement Form.

TIME	5/2-5/3 $L_{eq(h)}$ dBA	5/3-5/4 $L_{eq(h)}$ dBA
02:00 - 03:00 PM	68	68
03:00 - 04:00 PM	66	66
04:00 - 05:00 PM	67	67
05:00 - 06:00 PM	67	68
06:00 - 07:00 PM	67	67
07:00 - 08:00 PM	66	68
08:00 - 09:00 PM	65	65
09:00 - 10:00 PM	66	65
10:00 - 11:00 PM	62	62
11:00 - 12:00 AM	59	60
12:00 - 01:00 AM	56	60
01:00 - 02:00 AM	55	55
02:00 - 03:00 AM	54	55
03:00 - 04:00 AM	56	56
04:00 - 05:00 AM	59	60
05:00 - 06:00 AM	62	
06:00 - 07:00 AM	66	
07:00 - 08:00 AM	67	
08:00 - 09:00 AM	67	
09:00 - 10:00 AM	66	
10:00 - 11:00 AM	67	
11:00 - 12:00 PM	67	
12:00 - 01:00 PM	66	
01:00 - 02:00 PM	66	



FIELD SURVEY FORM

PROJECT: Pyramid/McCarran

ENGINEER: M. Meyer

DATE: 5/2

MEASUREMENT ADDRESS: 3170 S Prout Way

CITY: Sparks, NV

☑ Single-Family ☐ Multi-Family ☐ School ☐ Recreational ☐ Commercial ☐ Church

SITE NO.: LTS

SOUND LEVEL METER:
☐ LD-870 ☑ LD-820 ☐ B&K-2238
☐ LD-824 ☐ LD-812 ☐ B&K-2250
☐ LD-2900 ☐ _____

SERIAL #: 1688

MICROPHONE:
☑ ½-INCH ☐ 1-INCH
☑ WIND SCREEN
MAKE AND MODEL: 2560

SERIAL #: 2448

PRE AMP:
☐ LD-900 ☐ ZC-0030
☑ LD-828 ☐ ZC-0032
☐ LD-824 ☐ _____

SERIAL #: 2611

CALIBRATOR:
☑ LD CA250 ☐ LD CA200
☐ B&K 4231 ☐ _____
S/N 7309

Freq, Hz.
☑ 250
☐ 1k
☐ 84
☐ ___

CALIBRATION RECORD:
B&K SLM: Input, dB / Sens.(mV/Pa) / Δ from Prev., dB /Time
LD SLM: Input, dB / Reading, dB / Offset, dB / Time
Before 114 / 1160 / 68 / 3:13
After 114 / 1400 / 65 / 10:02

METER SETTINGS:
☑ A-WTD ☐ LINEAR ☑ SLOW ☐ 1/1 OCT ☑ INTERVALS 20 - MINUTE
☐ C-WTD ☐ IMPULSE ☐ FAST ☐ 1/3 OCT ☑ L_N PERCENTILE VALUES

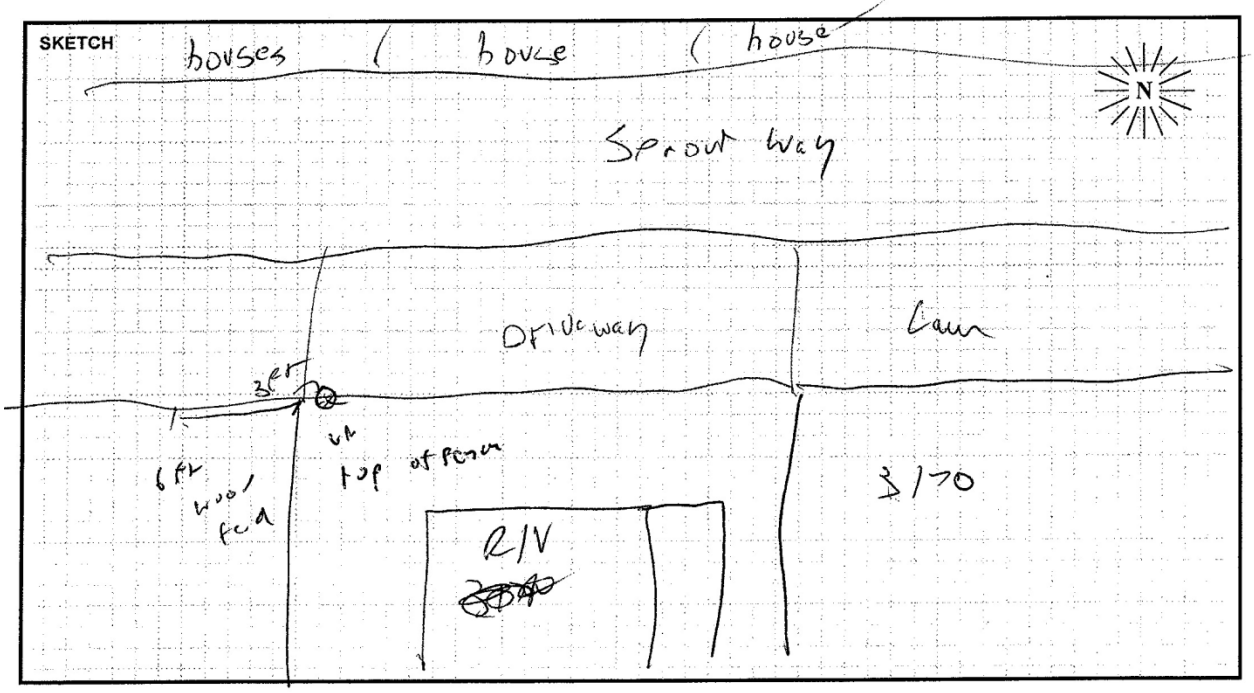
NOTES:
SYSTEM PWR: ☒ BAT ☐ AC
(observations at start of measurement)
TEMP: 70 °F R.H.: 21 %
WIND SPEED: _____ MPH
TOWARD (DIR): _____
SKIES: Cloudy
CAMERA _____
PHOTO NOs. _____

NOTES: Dist. to Center of Nearest Lane _____ ☐ Video ☐ Radar Counts AT MT HT

MEAS. TYPE: ☑ Long Term ☐ Short Term

DATE	START TIME	STOP TIME	L_{MIN}	L_{99}	L_{90}	L_{50}	L_{25}	L_{10}	L_{01}	L_{MAX}	L_{EQ}	NOTES:
5/2	3:20											Batteries Died
5/3												
5/4		10:00										

SKETCH

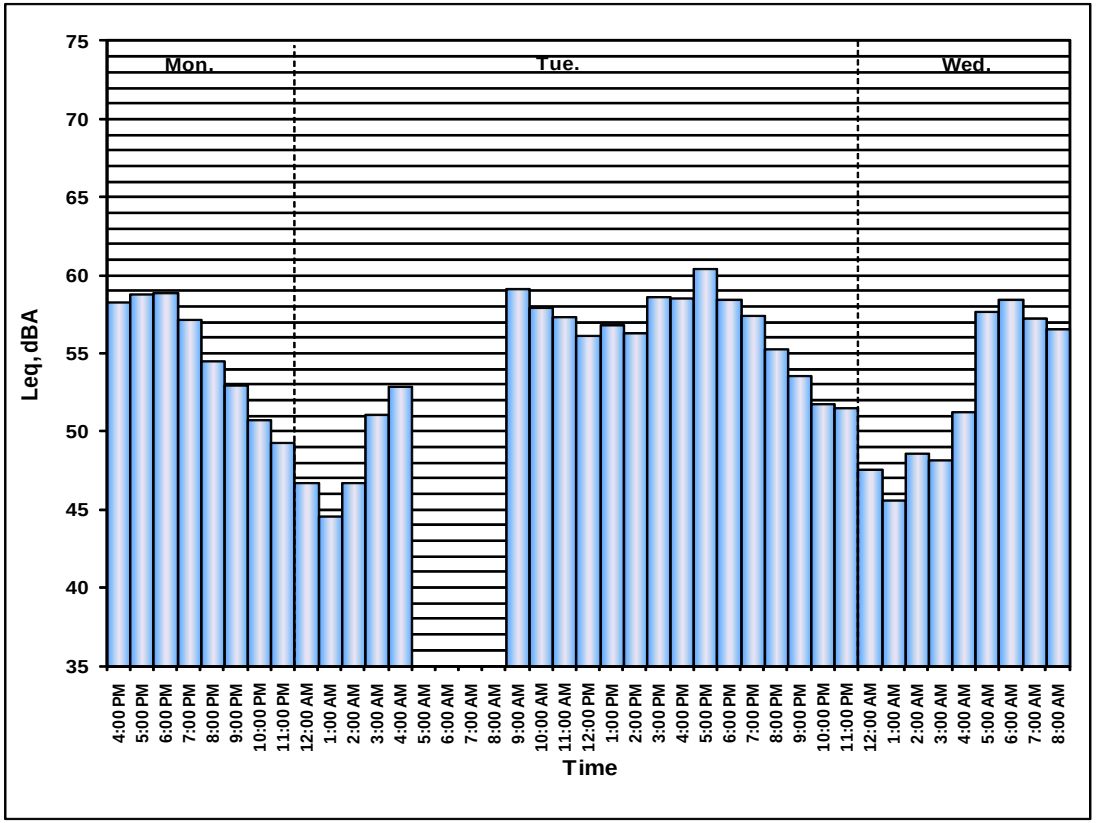


PARSONS

Site LT5 Hourly Noise Levels, $L_{eq}(h)$

Location: 3170 Sprout Way, Sparks
Position: Backyard
Sources: Traffic on Pyramid Highway
Date: 05/02/11 - 05/04/11 **Notes:** See attached Noise Measurement Form.

TIME	5/2-5/3 $L_{eq(h)}$ dBA	5/3-5/4 $L_{eq(h)}$ dBA
04:00 - 05:00 PM	58	59
05:00 - 06:00 PM	59	60
06:00 - 07:00 PM	59	58
07:00 - 08:00 PM	57	57
08:00 - 09:00 PM	55	55
09:00 - 10:00 PM	53	54
10:00 - 11:00 PM	51	52
11:00 - 12:00 AM	49	52
12:00 - 01:00 AM	47	48
01:00 - 02:00 AM	45	46
02:00 - 03:00 AM	47	49
03:00 - 04:00 AM	51	48
04:00 - 05:00 AM	53	51
05:00 - 06:00 AM	--	58
06:00 - 07:00 AM	--	58
07:00 - 08:00 AM	--	57
08:00 - 09:00 AM	--	57
09:00 - 10:00 AM	59	
10:00 - 11:00 AM	58	
11:00 - 12:00 PM	57	
12:00 - 01:00 PM	56	
01:00 - 02:00 PM	57	
02:00 - 03:00 PM	56	
03:00 - 04:00 PM	59	



FIELD SURVEY FORM

PROJECT: Pyramid/McCarran		ENGINEER: M. Meyer	DATE: 5/2
MEASUREMENT ADDRESS: 3232 Jamestown Court	CITY: Sparks, NV	☑ Single-Family ☐ Multi-Family ☐ School ☐ Recreational ☐ Commercial ☐ Church	SITE NO.: LT 6

SOUND LEVEL METER:
☐ LD-870 ☐ LD-820 ☐ B&K-2238
☐ LD-824 ☑ LD-812 ☐ B&K-2250
☐ LD-2900 ☐ _____
SERIAL #: 0659

MICROPHONE:
☑ 1/2-INCH ☐ 1-INCH
☑ WIND SCREEN
MAKE AND MODEL:
SERIAL #: 3378

PRE AMP:
☐ LD-900 ☐ ZC-0030
☑ LD-828 ☐ ZC-0032
☐ LD-824 ☐ _____
SERIAL #: 1891

CALIBRATOR:
☑ LD CA250 ☐ LD CA200
☐ B&K 4231 ☐ _____
S/N 7103
Freq, Hz.: ☑ 250 ☐ 1k ☐ 84 ☐ ___

CALIBRATION RECORD:
B&K SLM: Input, dB / Sens.(mV/Pa) / Δ from Prev., dB /Time
LD SLM: Input, dB / Reading, dB / Offset, dB / Time
Before 114.0 / 114.0 / 0.7 / 09:26
After 114.0 / 113.8 / 0.7 / 15:09

METER SETTINGS:
☑ A-WTD ☐ LINEAR ☑ SLOW ☐ 1/1 OCT ☑ INTERVALS 20 MINUTE
☐ C-WTD ☐ IMPULSE ☐ FAST ☐ 1/3 OCT ☑ L_N PERCENTILE VALUES

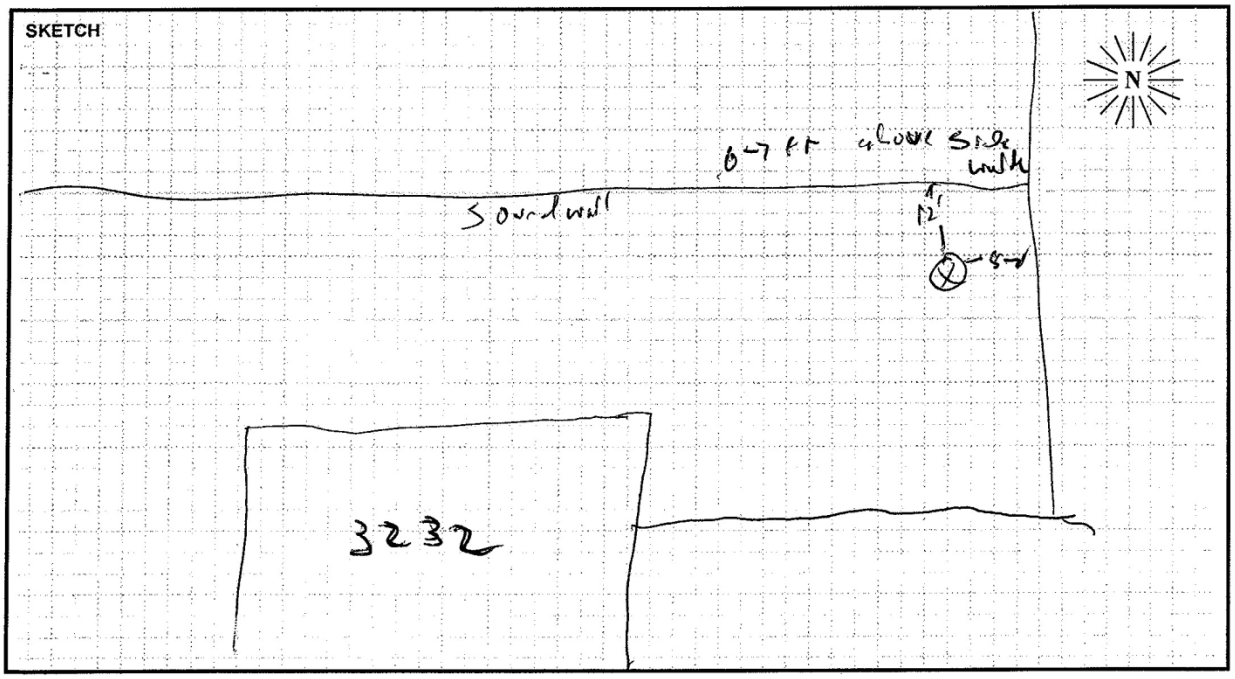
NOTES:
SYSTEM PWR: ☑ BAT ☐ AC
(observations at start of measurement)
TEMP: 76 °F R.H.: 23 %
WIND SPEED: _____ MPH
TOWARD (DIR): _____
SKIES: Cloudy
CAMERA _____
PHOTO NOs. _____

NOTES: Dist. to Center of Nearest Lane _____ ☐ Video ☐ Radar Counts AT MT HT

MEAS. TYPE: ☑ Long Term ☐ Short Term

DATE	START TIME	STOP TIME	L_{MIN}	L_{99}	L_{90}	L_{50}	L_{25}	L_{10}	L_{01}	L_{MAX}	L_{EQ}	NOTES:
5/2	4:24											Owner request
5/3		5:00										office no pick up

SKETCH

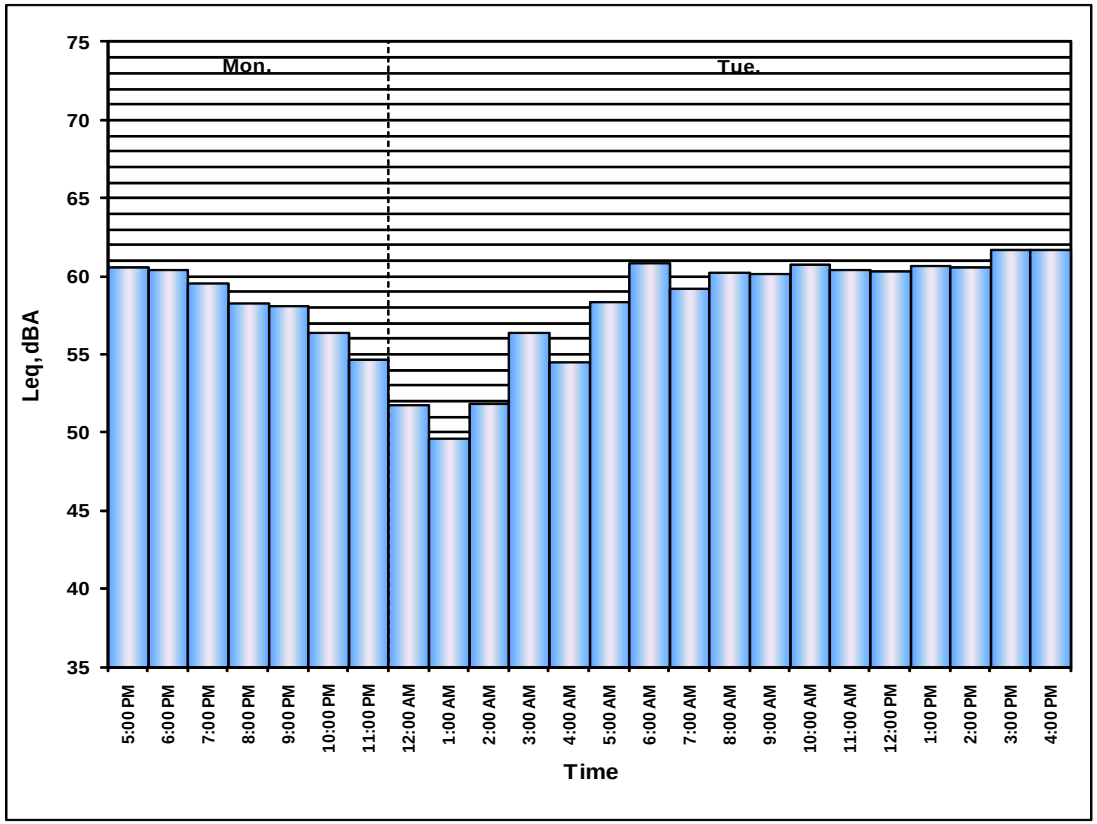


PARSONS

Site LT6 Hourly Noise Levels, $L_{eq}(h)$

Location: 3232 Jamestown Court, Sparks
Position: Backyard
Sources: Traffic on Pyramid Highway
Date: 05/02/11 - 05/03/11 **Notes:** See attached Noise Measurement Form.

TIME	5/2-5/3 $L_{eq(h)}$ dBA
05:00 - 06:00 PM	61
06:00 - 07:00 PM	60
07:00 - 08:00 PM	60
08:00 - 09:00 PM	58
09:00 - 10:00 PM	58
10:00 - 11:00 PM	56
11:00 - 12:00 AM	55
12:00 - 01:00 AM	52
01:00 - 02:00 AM	50
02:00 - 03:00 AM	52
03:00 - 04:00 AM	56
04:00 - 05:00 AM	55
05:00 - 06:00 AM	58
06:00 - 07:00 AM	61
07:00 - 08:00 AM	59
08:00 - 09:00 AM	60
09:00 - 10:00 AM	60
10:00 - 11:00 AM	61
11:00 - 12:00 PM	60
12:00 - 01:00 PM	60
01:00 - 02:00 PM	61
02:00 - 03:00 PM	61
03:00 - 04:00 PM	62
04:00 - 05:00 PM	62



FIELD SURVEY FORM

PROJECT: Pyramid/McCarran	ENGINEER: M. Meyer		DATE: 5/2
MEASUREMENT ADDRESS: 771 Mercy Court.	CITY: Sparks, NV	☒ Single-Family ☐ Multi-Family ☐ School ☐ Recreational ☐ Commercial ☐ Church	SITE NO.: 457

SOUND LEVEL METER:
☐ LD-870 ☒ LD-820 ☐ B&K-2238
☐ LD-824 ☐ LD-812 ☐ B&K-2250
☐ LD-2900 ☐ _____

SERIAL #: 1709

MICROPHONE:
☒ 1/2-INCH ☐ 1-INCH
☒ WIND SCREEN
MAKE AND MODEL:

SERIAL #: 3465

PRE AMP:
☐ LD-900 ☐ ZC-0030
☒ LD-828 ☐ ZC-0032
☐ LD-824 ☐ _____

SERIAL #: 2571

CALIBRATOR:
☒ LD CA250 ☐ LD CA200
☐ B&K 4231 ☐ _____
S/N 7309

Freq, Hz.
☒ 250
☐ 1k
☐ 84
☐ ___

CALIBRATION RECORD:
B&K SLM: Input, dB / Sens.(mV/Pa) / Δ from Prev., dB /Time
LD SLM: Input, dB / Reading, dB / Offset, dB / Time
Before 114 , 114.0 , 94 , 3:55
After 114.0 , 114.0 , 94 , 10:15

METER SETTINGS:
☒ A-WTD ☐ LINEAR ☒ SLOW ☐ 1/1 OCT ☒ INTERVALS 20 - MINUTE
☐ C-WTD ☐ IMPULSE ☐ FAST ☐ 1/3 OCT ☒ L_N PERCENTILE VALUES

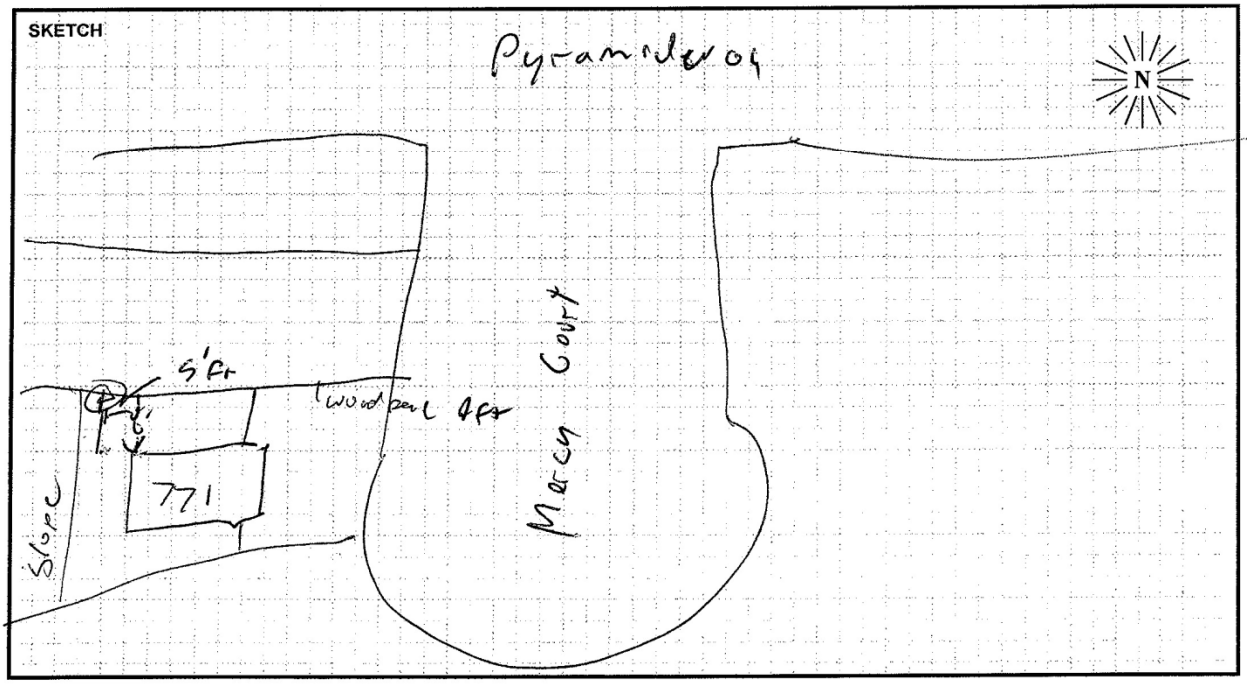
NOTES:
SYSTEM PWR: ☐ BAT ☐ AC
(observations at start of measurement)
TEMP: 67° °F R.H.: 24 %
WIND SPEED: _____ MPH
TOWARD (DIR): _____
SKIES: Cloudy
CAMERA _____
PHOTO NOs. _____

NOTES: Dist. to Center of Nearest Lane _____ ☐ Video ☐ Radar Counts AT MT HT

MEAS. TYPE:
☒ Long Term
☐ Short Term

DATE	START TIME	STOP TIME	L_{MIN}	L_{99}	L_{90}	L_{50}	L_{25}	L_{10}	L_{01}	L_{MAX}	L_{EQ}	NOTES:
5/2	3:55											
5/4		10:11										

SKETCH

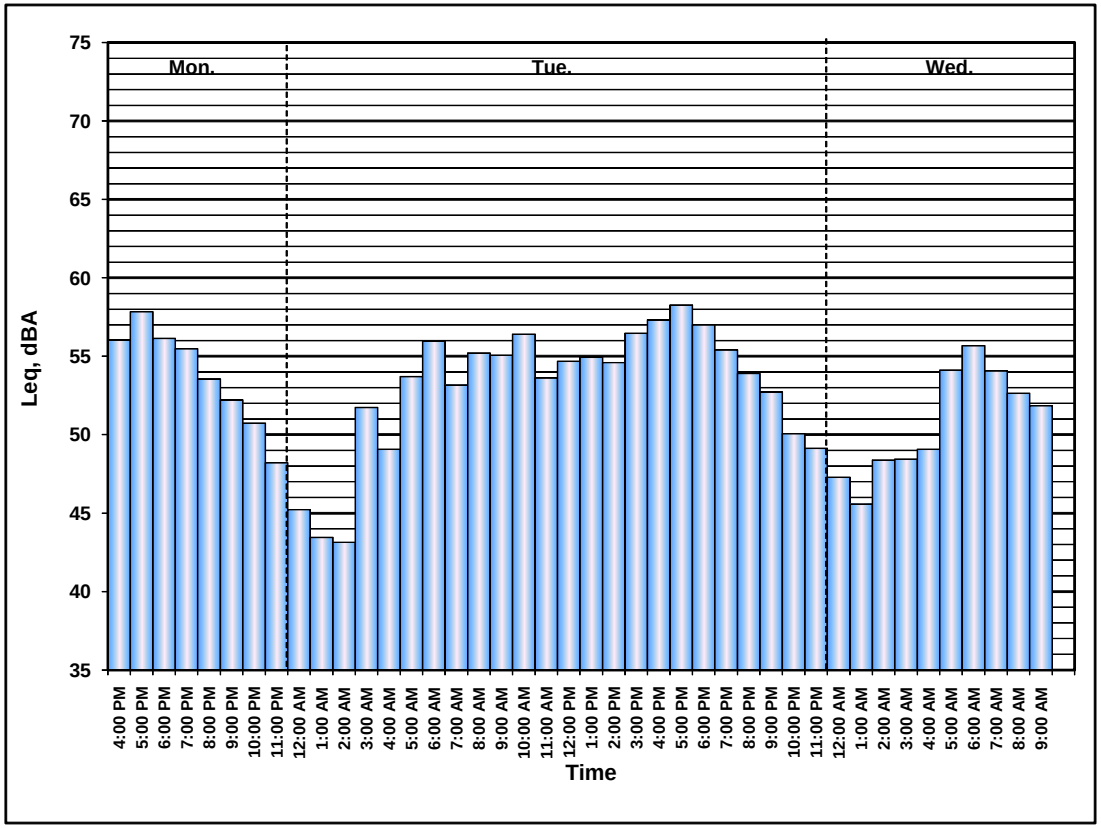


PARSONS

Site LT7 Hourly Noise Levels, $L_{eq}(h)$

Location: 771 Mercy Court, Sparks
Position: Backyard
Sources: Traffic on Pyramid Highway
Date: 05/02/11 - 05/04/11 **Notes:** See attached Noise Measurement Form.

TIME	5/2-5/3 $L_{eq(h)}$ dBA	5/3-5/4 $L_{eq(h)}$ dBA
04:00 - 05:00 PM	56	57
05:00 - 06:00 PM	58	58
06:00 - 07:00 PM	56	57
07:00 - 08:00 PM	55	55
08:00 - 09:00 PM	54	54
09:00 - 10:00 PM	52	53
10:00 - 11:00 PM	51	50
11:00 - 12:00 AM	48	49
12:00 - 01:00 AM	45	47
01:00 - 02:00 AM	43	46
02:00 - 03:00 AM	43	48
03:00 - 04:00 AM	52	48
04:00 - 05:00 AM	49	49
05:00 - 06:00 AM	54	54
06:00 - 07:00 AM	56	56
07:00 - 08:00 AM	53	
08:00 - 09:00 AM	55	
09:00 - 10:00 AM	55	
10:00 - 11:00 AM	56	
11:00 - 12:00 PM	54	
12:00 - 01:00 PM	55	
01:00 - 02:00 PM	55	
02:00 - 03:00 PM	55	
03:00 - 04:00 PM	56	



FIELD SURVEY FORM

PROJECT: Pyramid/McCarran		ENGINEER: M. Meyer	DATE: 5/5
MEASUREMENT ADDRESS: 2600 Nelson Way	CITY: Sparks, NV	☑ Single-Family ☐ Multi-Family ☐ School ☐ Recreational ☐ Commercial ☐ Church	SITE NO.: ST1

SOUND LEVEL METER: ☐ LD-870 ☑ LD-820 ☐ B&K-2238 ☐ LD-824 ☐ LD-812 ☐ B&K-2250 ☐ LD-2900 ☐ _____
SERIAL #: 1177

MICROPHONE: ☑ 1/2-INCH ☐ 1-INCH ☐ WIND SCREEN
MAKE AND MODEL: GRAS
SERIAL #: 16967

PRE AMP: ☐ LD-900 ☐ ZC-0030 ☑ LD-828 ☐ ZC-0032 ☐ LD-824 ☐ _____
SERIAL #: 1625

CALIBRATOR: ☑ LD CA250 ☐ LD CA200 ☐ B&K 4231 ☐ _____ S/N 7305
Freq, Hz. ☑ 250 ☐ 1k ☐ 84 ☐ ___

CALIBRATION RECORD:
B&K SLM: Input, dB / Sens.(mV/Pa) / Δ from Prev., dB /Time
LD SLM: Input, dB / Reading, dB / Offset, dB / Time
Before 114 , 114 , 7.7 , 9:02
After 114.0 , 114.0 , 7.7 , 10:01

METER SETTINGS: ☑ A-WTD ☐ C-WTD ☐ LINEAR ☐ IMPULSE ☑ SLOW ☐ FAST ☐ 1/1 OCT ☐ 1/3 OCT ☑ INTERVALS 20 - MINUTE ☑ L_N PERCENTILE VALUES

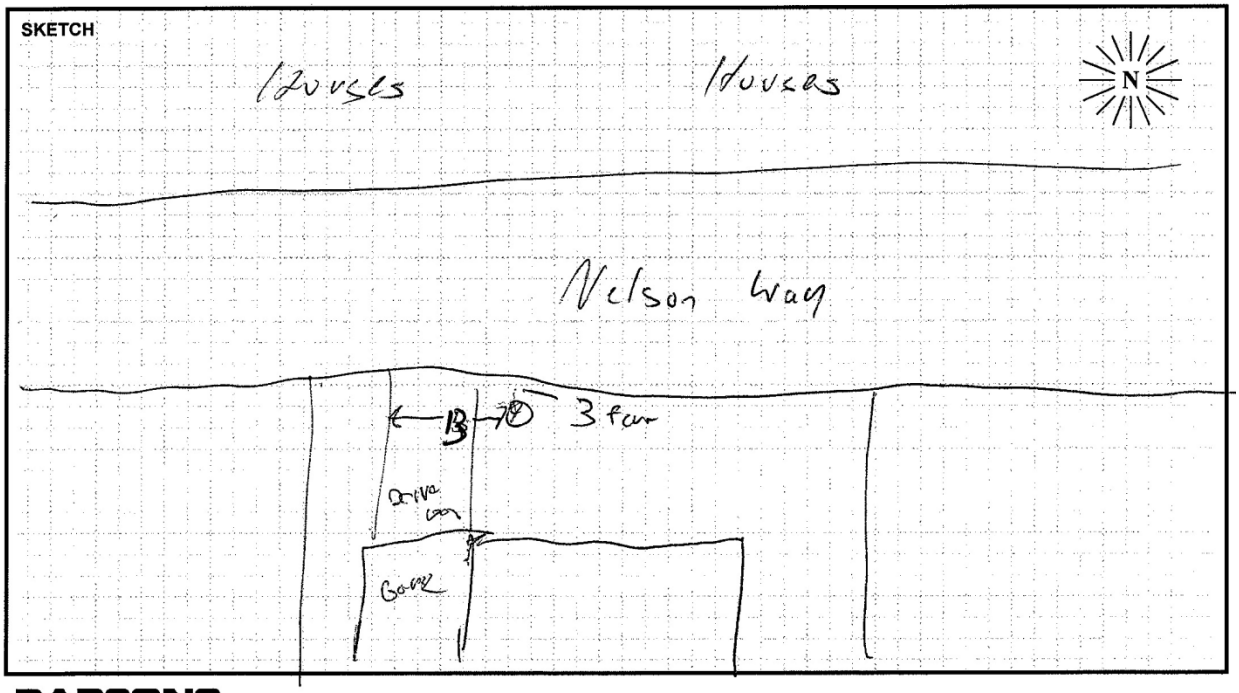
NOTES:
SYSTEM PWR: ☐ BAT ☐ AC
(observations at start of measurement)
TEMP: 52 °F R.H.: 25 %
WIND SPEED: _____ MPH
TOWARD (DIR): _____
SKIES: Clear
CAMERA _____
PHOTO NOs. _____

NOTES: Dist. to Center of Nearest Lane _____ ☐ Video ☐ Radar Counts AT MT HT

MEAS. TYPE: ☐ Long Term ☑ Short Term

DATE	START TIME	STOP TIME	L_{MIN}	L_{99}	L_{90}	L_{50}	L_{25}	L_{10}	L_{01}	L_{MAX}	L_{EQ}	NOTES:
5/3	9:06	9:26	45.3	45.7	47.0	49.0	51.2	54.1	62.5	69.7	52.6	

SKETCH



PARSONS

FIELD SURVEY FORM

PROJECT: Pyramid/McCarran | ENGINEER: M. Meyer | DATE: 5/3

MEASUREMENT ADDRESS: Immaculate Conception church | CITY: Sparks, NV | ☐ Single-Family ☐ Multi-Family ☐ School ☐ Recreational ☐ Commercial ☒ Church | SITE NO.: 512

SOUND LEVEL METER: ☐ LD-870 ☒ LD-820 ☐ B&K-2238 ☐ LD-824 ☐ LD-812 ☐ B&K-2250 ☐ LD-2900 ☐ _____
SERIAL #: 1177

MICROPHONE: ☑ 1/2-INCH ☐ 1-INCH ☑ WIND SCREEN
MAKE AND MODEL: G.R.A.S.
SERIAL #: 16963

PRE AMP: ☐ LD-900 ☐ ZC-0030 ☑ LD-828 ☐ ZC-0032 ☐ LD-824 ☐ _____
SERIAL #: 16264

CALIBRATOR: ☑ LD CA250 ☐ LD CA200 ☐ B&K 4231 ☐ _____ S/N 2309
Freq, Hz: ☑ 250 ☐ 1k ☐ 84 ☐ ___

CALIBRATION RECORD:
B&K SLM: Input, dB / Sens.(mV/Pa) / Δ from Prev., dB /Time
LD SLM: Input, dB / Reading, dB / Offset, dB / Time
Before 114.0 / 114.0 / 0.0 / 10:00
After 114.0 / 113.8 / 0.2 / 11:19

METER SETTINGS: ☑ A-WTD ☐ LINEAR ☐ SLOW ☐ 1/1 OCT ☑ INTERVALS 20 - MINUTE ☐ C-WTD ☐ IMPULSE ☐ FAST ☐ 1/3 OCT ☑ L_N PERCENTILE VALUES

NOTES:
SYSTEM PWR: ☑ BAT ☐ AC
(observations at start of measurement)
TEMP: 65 °F R.H.: 22 %
WIND SPEED: _____ MPH
TOWARD (DIR): _____
SKIES: Clear
CAMERA _____
PHOTO NOs. _____

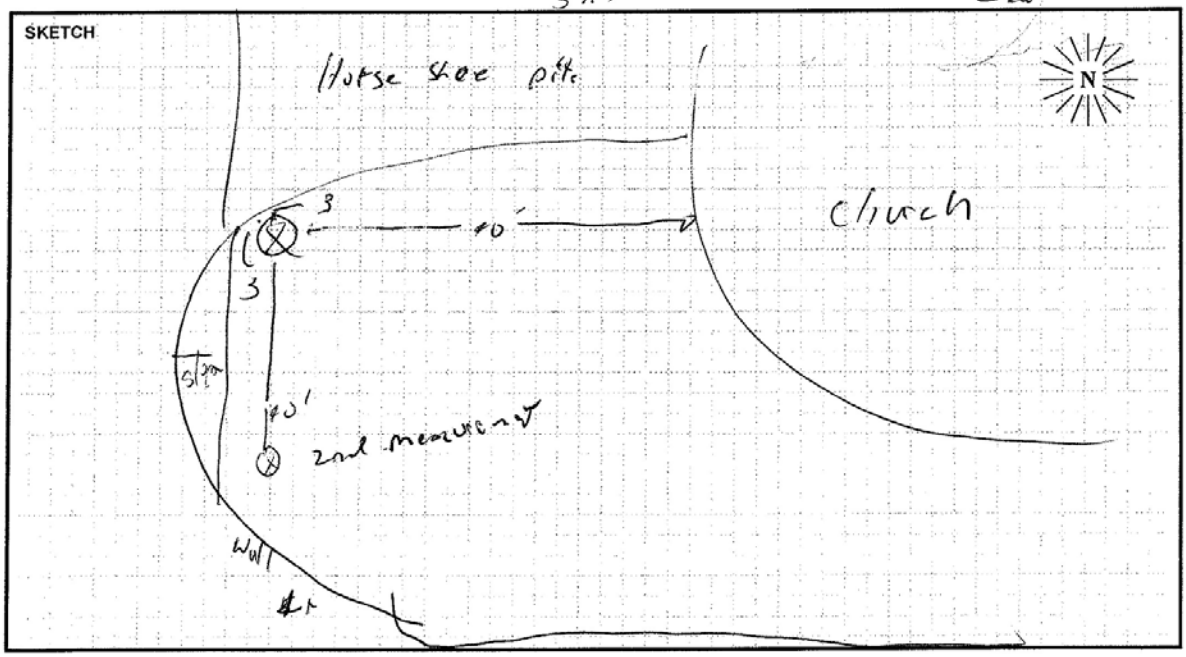
NOTES: Dist. to Center of Nearest Lane _____ ☐ Video ☐ Radar Counts AT MT HT

MEAS. TYPE: ☐ Long Term ☒ Short Term

DATE	START TIME	STOP TIME	L_{MIN}	L_{99}	L_{90}	L_{50}	L_{25}	L_{10}	L_{01}	L_{MAX}	L_{EQ}	NOTES:
5/3	10:06	10:26	45.0	46.4	50.9	54.5	59.7	55.1	61.7	64.8	56.3	Road Noise
5/3	10:26	1:03	48.1	54.2	51.3	56.7	60.7	62.2	64.3	66.2	59.4	
5/4	8:40	9:00	47.2	49.3	53.2	57.4	60.7	61.3	66.2	69.5	58.5	63 OP 21%

59.7 Clear

SKETCH



PARSONS

Radar Speed mark On the back

FIELD SURVEY FORM

PROJECT: Pyramid/McCarran		ENGINEER: M. Meyer	DATE: 5/3
MEASUREMENT ADDRESS: 2965 McCarran Blvd	CITY: Sparks, NV	☑ Single-Family ☐ Multi-Family ☐ School ☐ Recreational ☐ Commercial ☐ Church	SITE NO.: 55

SOUND LEVEL METER:
☐ LD-870 ☑ LD-820 ☐ B&K-2238
☐ LD-824 ☐ LD-812 ☐ B&K-2250
☐ LD-2900 ☐ _____
SERIAL #: 1177

MICROPHONE:
☑ 1/2-INCH ☐ 1-INCH
☑ WIND SCREEN
MAKE AND MODEL: GRAS
SERIAL #: 16767

PRE AMP:
☐ LD-900 ☐ ZC-0030
☑ LD-828 ☐ ZC-0032
☐ LD-824 ☐ _____
SERIAL #: 1629

CALIBRATOR:
☑ LD CA250 ☐ LD CA200
☐ B&K 4231 ☐ _____
S/N 7903
Freq, Hz.: ☐ 250 ☐ 1k ☐ 84 ☐ ___

CALIBRATION RECORD:
B&K SLM: Input, dB / Sens.(mV/Pa) / Δ from Prev., dB /Time
LD SLM: Input, dB / Reading, dB / Offset, dB / Time
Before 114 , 114.0 , 7.7 , 10:04
After 114 , 113.8 , 7.0 , 11:15

METER SETTINGS:
☑ A-WTD ☐ LINEAR ☑ SLOW ☐ 1/1 OCT ☑ INTERVALS 20 - MINUTE
☐ C-WTD ☐ IMPULSE ☐ FAST ☐ 1/3 OCT ☑ L_N PERCENTILE VALUES

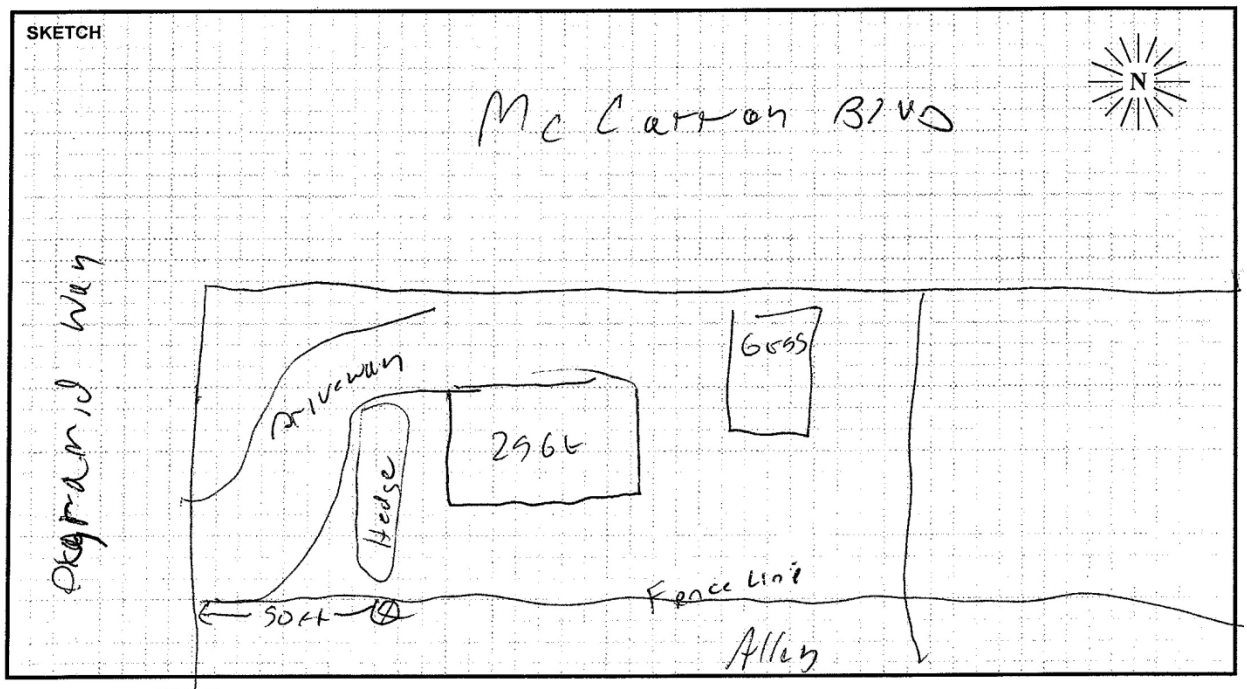
NOTES:
SYSTEM PWR: ☐ BAT ☐ AC
(observations at start of measurement)
TEMP: 68 °F R.H.: 26 %
WIND SPEED: _____ MPH
TOWARD (DIR): _____
SKIES: Clear
CAMERA _____
PHOTO NOs. _____

NOTES: Dist. to Center of Nearest Lane _____ ☐ Video ☐ Radar Counts AT MT HT

MEAS. TYPE: ☐ Long Term ☑ Short Term

DATE	START TIME	STOP TIME	L_{MIN}	L_{99}	L_{90}	L_{50}	L_{25}	L_{10}	L_{01}	L_{MAX}	L_{EQ}	NOTES:
5/3	10:56	11:16	44.4	55.2	52.0	59.2	61.1	63.2	69.0	72.9	60.7	

SKETCH



PARSONS

FIELD SURVEY FORM

PROJECT: Pyramid/McCarran

ENGINEER: M. Meyer

DATE: 5/3

MEASUREMENT ADDRESS: Drake Elem. School

CITY: Sparks, NV

☐ Single-Family ☐ Recreational
☐ Multi-Family ☐ Commercial
☒ School ☐ Church

SITE NO.: ST6

SOUND LEVEL METER:
☐ LD-870 ☑ LD-820 ☐ B&K-2238
☐ LD-824 ☐ LD-812 ☐ B&K-2250
☐ LD-2900 ☐ _____

SERIAL #: 1177

MICROPHONE:
☑ 1/2-INCH ☐ 1-INCH
☑ WIND SCREEN

MAKE AND MODEL: GRAS

SERIAL #: 16967

PRE AMP:
☐ LD-900 ☐ ZC-0030
☑ LD-828 ☐ ZC-0032
☐ LD-824 ☐ _____

SERIAL #: 16297

CALIBRATOR:
☑ LD CA250 ☐ LD CA200
☐ B&K 4231 ☐ _____
S/N 2903

Freq, Hz.
☑ 250
☐ 1k
☐ 84
☐ ___

CALIBRATION RECORD:
B&K SLM: Input, dB / Sens.(mV/Pa) / Δ from Prev., dB /Time
LD SLM: Input, dB / Reading, dB / Offset, dB / Time

Before 114.0 / 114.0 / 60 / 1:00pm

After 114.0 / 111.0 / 80 / 2:30pm

METER SETTINGS:
☑ A-WTD ☐ LINEAR ☑ SLOW ☐ 1/1 OCT ☑ INTERVALS 20 - MINUTE
☐ C-WTD ☐ IMPULSE ☐ FAST ☐ 1/3 OCT ☑ L_N PERCENTILE VALUES

NOTES:

SYSTEM PWR: ☒ BAT ☐ AC

(observations at start of measurement)

TEMP: 75 °F R.H.: 28 %

WIND SPEED: _____ MPH

TOWARD (DIR): _____

SKIES: Clear

CAMERA _____

PHOTO NOs. _____

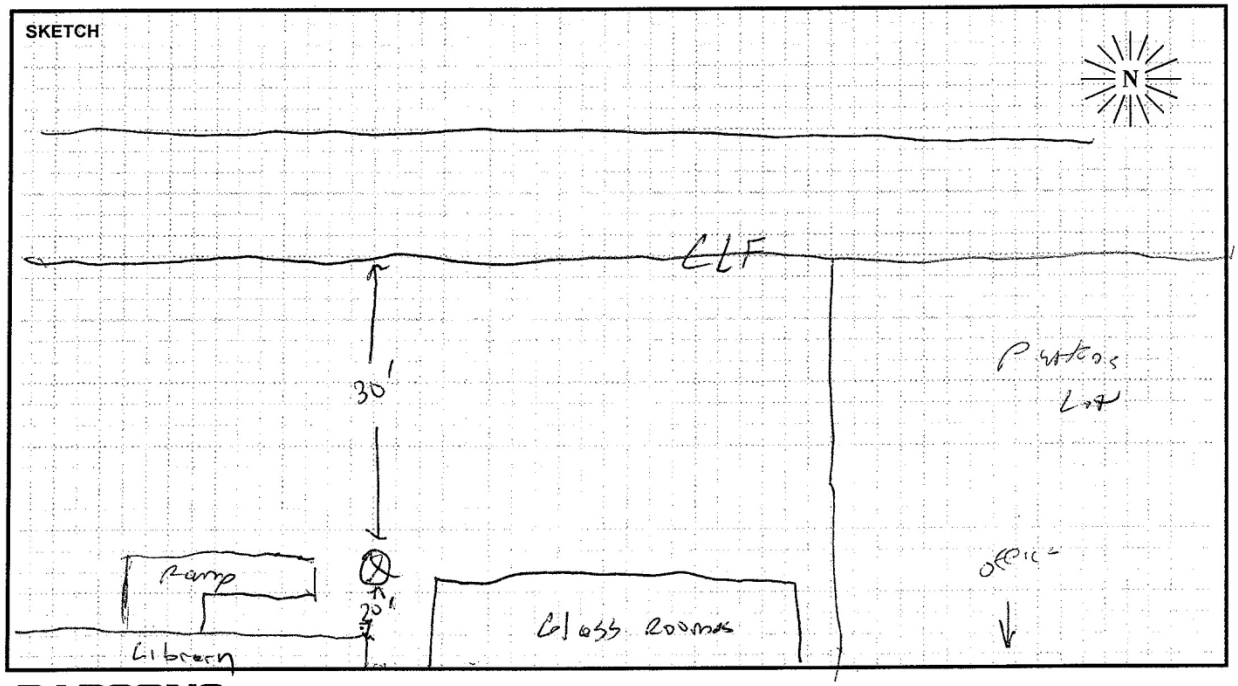
NOTES:

Dist. to Center of Nearest Lane _____
☐ Video ☐ Radar
Counts AT MT HT

MEAS. TYPE:
☐ Long Term
☒ Short Term

DATE	START TIME	STOP TIME	L_{MIN}	L_{99}	L_{90}	L_{50}	L_{25}	L_{10}	L_{01}	L_{MAX}	L_{EQ}	NOTES:
5/3	2:00	2:18	45.8	46.1	48.2	51.5	54.2	56.3	58.1	60.9	53.2	
5/3	2:18	2:24	51.3	51.3	52.4	55.7	58.3	60.4	63.7	63.9	57.2	Bus went by

SKETCH



PARSONS

FIELD SURVEY FORM

PROJECT: Pyramid/McCarran | ENGINEER: M. Meyer | DATE: 5/3

MEASUREMENT ADDRESS: Kid in His Care Pre School | CITY: Sparks, NV | ☐ Single-Family ☐ Multi-Family ☒ School ☐ Recreational ☐ Commercial ☐ Church | SITE NO.: ST3

SOUND LEVEL METER:
☐ LD-870 ☒ LD-820 ☐ B&K-2238
☐ LD-824 ☐ LD-812 ☐ B&K-2250
☐ LD-2900 ☐ _____
SERIAL #: 1177

MICROPHONE:
☑ 1/2-INCH ☐ 1-INCH
☑ WIND SCREEN
MAKE AND MODEL: GRAS
SERIAL #: 16967

PRE AMP:
☐ LD-900 ☐ ZC-0030
☑ LD-828 ☐ ZC-0032
☐ LD-824 ☐ _____
SERIAL #: 1625

CALIBRATOR:
☑ LD CA250 ☐ LD CA200
☐ B&K 4231 ☐ _____
S/N 3903

Freq, Hz.
☑ 250
☐ 1k
☐ 84
☐ ___

CALIBRATION RECORD:
B&K SLM: Input, dB / Sens.(mV/Pa) / Δ from Prev., dB /Time
LD SLM: Input, dB / Reading, dB / Offset, dB / Time
Before 114.0, 114.0, 8.0, 12:05
After 114.0, 114.0, 8.0, 1:20

METER SETTINGS:
☒ A-WTD ☐ LINEAR ☒ SLOW ☐ 1/1 OCT ☒ INTERVALS 20 - MINUTE
☐ C-WTD ☐ IMPULSE ☐ FAST ☐ 1/3 OCT ☑ L_N PERCENTILE VALUES

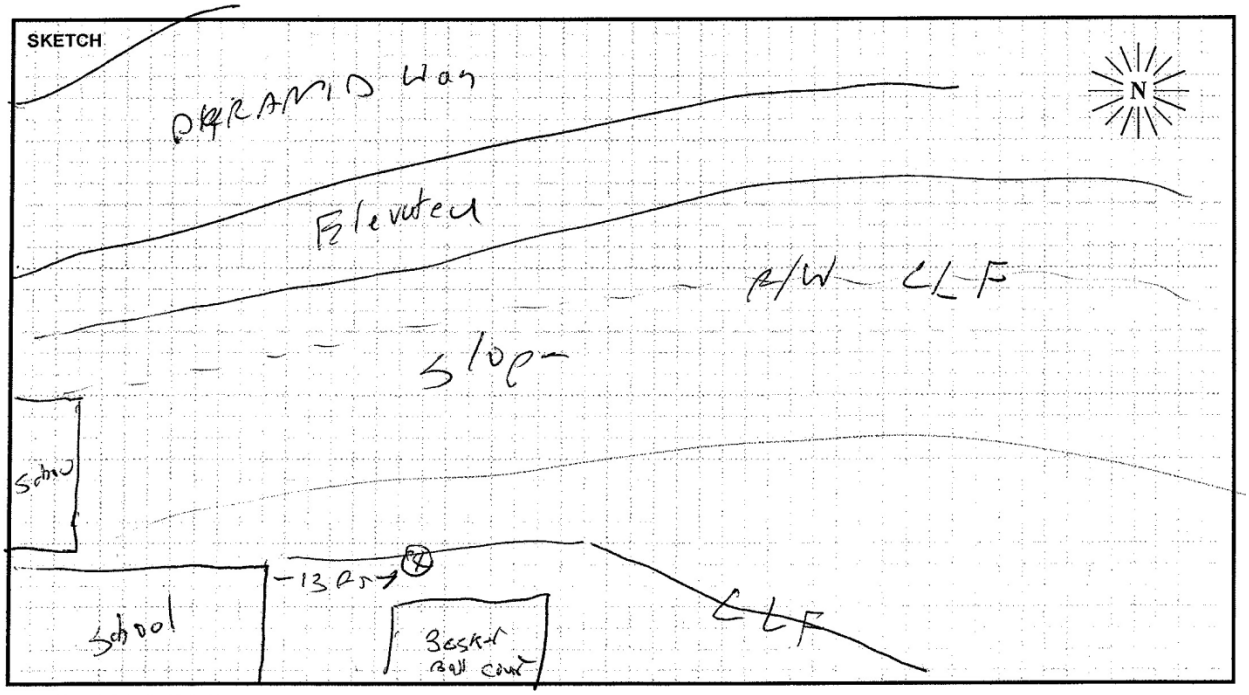
NOTES:
SYSTEM PWR: ☑ BAT ☐ AC
(observations at start of measurement)
TEMP: 74 °F R.H.: 21 %
WIND SPEED: _____ MPH
TOWARD (DIR): _____
SKIES: Clear
CAMERA Cleo
PHOTO NOs. _____

NOTES: Dist. to Center of Nearest Lane _____ ☐ Video ☐ Radar Counts AT MT HT

MEAS. TYPE: ☐ Long Term ☒ Short Term

DATE	START TIME	STOP TIME	L_{MIN}	L_{99}	L_{90}	L_{50}	L_{25}	L_{10}	L_{01}	L_{MAX}	L_{EQ}	NOTES:
5/3	12:27	12:47	41.8	42.6	47.1	52.8	55.2	57.7	61.4	66.4	54.3	

SKETCH

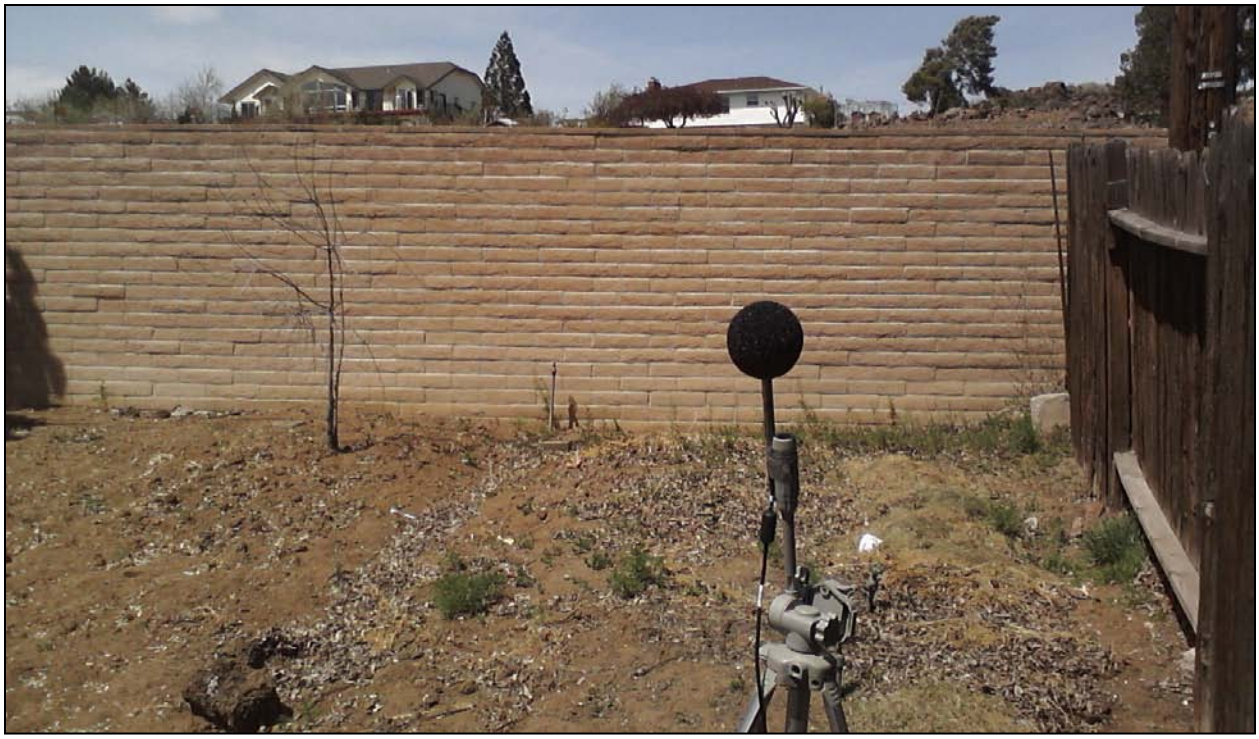


PARSONS

APPENDIX C:

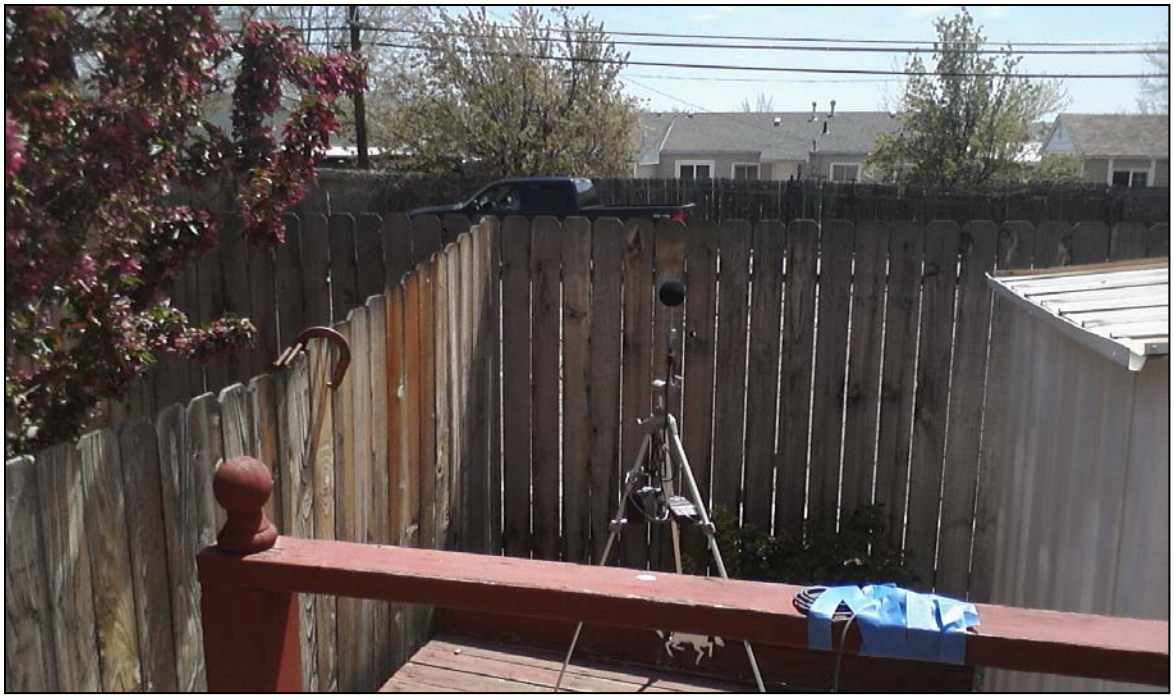
NOISE MEASUREMENT SITE PHOTOGRAPHS

LONG TERM MEASUREMENT SITE LT1

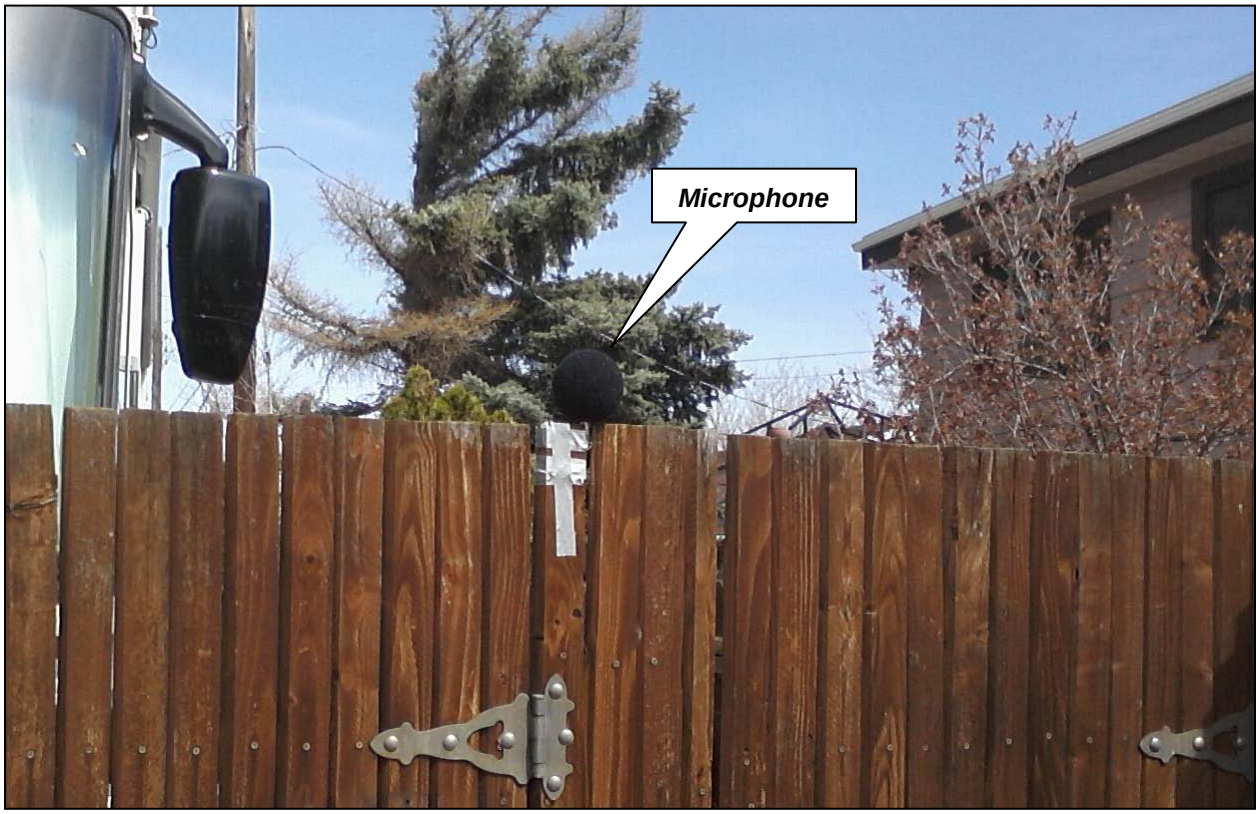


LONG TERM MEASUREMENT SITE LT2

LONG TERM MEASUREMENT SITE LT3



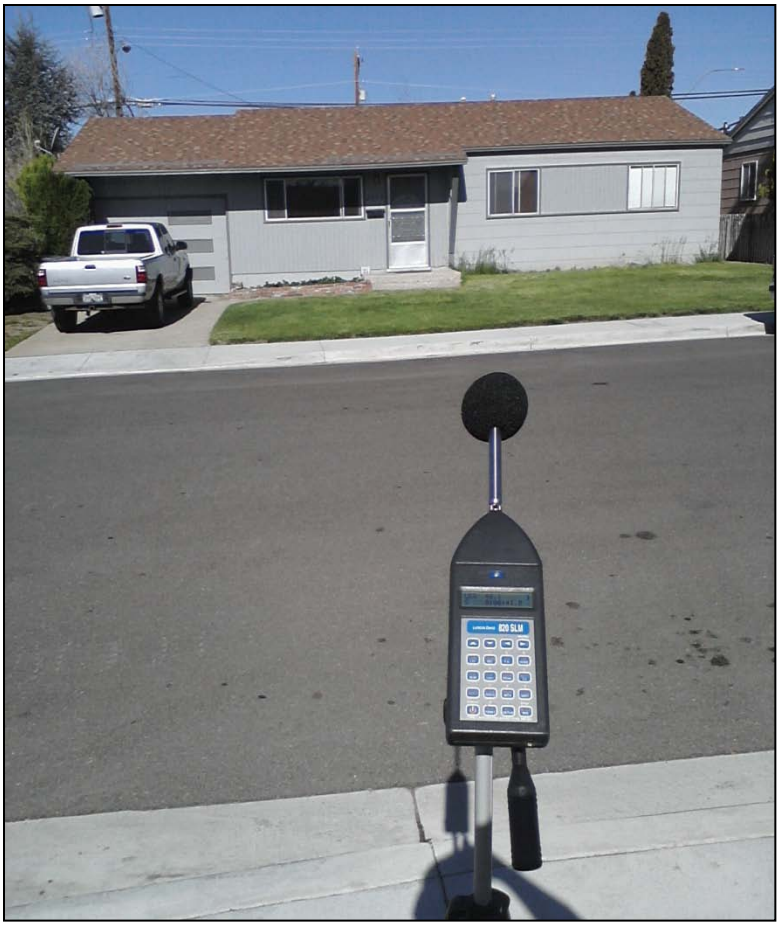
LONG TERM MEASUREMENT SITE LT4



LONG TERM MEASUREMENT SITE LT5

LONG TERM MEASUREMENT SITE LT6

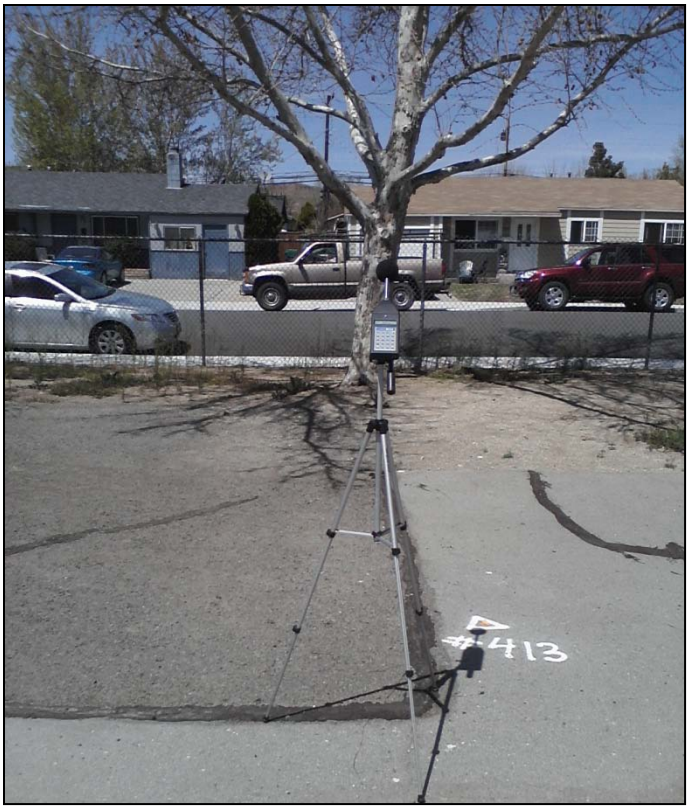
LONG TERM MEASUREMENT SITE LT7



SHORT TERM MEASUREMENT SITE ST1

SHORT TERM MEASUREMENT SITE ST2A

SHORT TERM MEASUREMENT SITE ST3



SHORT TERM MEASUREMENT SITE ST4

SHORT TERM MEASUREMENT SITE ST5